DRAFT ENVIRONMENTAL ASSESSMENT
RIO GRANDE BASIN WATERSHED STUDY, PHASE 1: SAN ACACIA SURFACE WATER/GROUNDWATER INVESTIGATION

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US Army Corps of Engineers®
Albuquerque District

New Mexico
Interstate Stream Commission

August 4, 2002

U.S. ARMY CORPS OF ENGINEERS
ALBUQUERQUE DISTRICT

DRAFT
FINDING OF NO SIGNIFICANT IMPACT

RIO GRANDE BASIN WATERSHED STUDY, PHASE I: SAN ACACIA SURFACE WATER/GROUND WATER INVESTIGATION (Section 729 Program)

Within the San Acacia to Elephant Butte reach of the Rio Grande, competing water demands for agricultural crops, municipal use, evaporation and transpiration, wildlife habitat, endangered species issues, and Rio Grande Compact delivery requirements necessitate a better understanding of the water budget. The proposed study entails investigations into the interaction of surface water flows and subsurface hydrology and would support a comprehensive hydrologic and ecosystem characterization in the reach of the Rio Grande between the San Acacia Diversion Dam and the delta of Elephant Butte Reservoir. The study consists of the installation and monthly monitoring of over 130 groundwater wells and several staff gages, in conjunction with monitoring of existing groundwater wells, along seven East-West transect lines that cross the floodplain between the San Acacia Diversion Dam and Elephant Butte Reservoir. Well installation and access areas are on a combination of Federal, State and private lands. Aquifer pumping tests are proposed during the first year of the study and monthly monitoring is anticipated for three years. Data analysis will help clarify the interactions between surface water and groundwater in the vicinity of the river, the Low Flow Conveyance Channel, and adjacent agricultural drains.

The results of this investigation will support the comprehensive water planning and management programs being undertaken by Federal, State, and private agencies and organizations in the Rio Grande basin. As authorized by Section 729 of the Water Resources Development Act of 1986, as amended, the study is being conducted in partnership with the New Mexico Interstate Stream Commission, which is contributing 50% of the estimated $1,093,000 total cost.

Various alternative study components (locations, drilling methods, equipment) were considered but eliminated during the planning phase of this project. Components were eliminated on the basis of potential environmental concerns or failure to meet the purpose and need of the project. Without the proposed study, predictive planning models of the effects of water operations on flow through the San Acacia Reach of the Rio Grande would not be possible, adversely affecting planning for the conservation of endangered species as well as water conveyance for interstate and international deliveries downstream.

The planned action has been fully coordinated with Federal, Tribal, and local governments with jurisdiction over the ecological, cultural and hydrologic resources in the project area, and would result in only minor and temporary impacts to vegetation, noise levels and water quality. A permit under Section 404 of the Clean Water Act will not be required.

Based upon these factors and others discussed in detail the Environmental Assessment, the planned action would not have a significant effect on the human environment; therefore, an Environmental Impact Statement will not be prepared for the conduct of the project.

_____ _____

Date

Dana R. Hurst
Lieutenant Colonel, EN
District Engineer

DRAFT
ENVIRONMENTAL ASSESSMENT
RIO GRANDE WATERSHED STUDY, PHASE 1: SAN ACACIA SURFACE WATER/GROUNDWATER INVESTIGATION

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ENVIRONMENTAL ASSESSMENT
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1. INTRODUCTION

1.01 BACKGROUND, PURPOSE, AND NEED

The proposed Rio Grande Watershed Study, Phase 1: San Acacia Surface Water/Groundwater Investigation (Investigation) involves comprehensive study of the interaction of surface water flows and subsurface hydrology in order to support a hydrologic and ecosystem characterization in the reach of the Rio Grande between the San Acacia Diversion Dam and the delta of Elephant Butte Reservoir (Figure 1). The Investigation consists of the installation of approximately 130 new groundwater monitoring wells and 25 staff gages, and monthly monitoring of all new wells along seven East-West transect lines that cross the floodplain of the Rio Grande between the San Acacia Diversion Dam and Elephant Butte Reservoir. The proposed well transects are shown in Figure 2.

This Investigation would be funded jointly by the U. S. Army Corps of Engineers (USACE) and the New Mexico Interstate Stream Commission (ISC), under the authority of section 729 of the Water Resources Development Act of 1986, as amended. The total project cost of $1,093,000 would be shared equally by the ISC and the USACE.

Within the San Acacia to Elephant Butte reach of the Rio Grande, competing water demands for agricultural crops, municipal use, evaporation and evapotranspiration, wildlife habitat, endangered species issues and Rio Grande Compact delivery requirements necessitate a better understanding of the water budget. The purpose of this work is to collect the data that would help in better understanding the interactions between surface water and groundwater in the vicinity of the river, the Low Flow Conveyance Channel (LFCC) and adjacent agricultural drains. This work would support the comprehensive water planning and management programs being undertaken by the USACE, the ISC, the Save Our Bosque Task Force, and other agencies and organizations in the Rio Grande basin.

The project schedule calls for installation of new wells between September of 2002 and April of 2003. Aquifer pumping tests are proposed during the first year of the study and monthly monitoring is proposed for three consecutive years. Data collected from the installation and monthly monitoring of the wells would be stored in a relational database at the ISC. Data would be applied to develop a model of the surface water/groundwater interaction. As data is collected, it would be available to the public upon request. Finalized data, reports, and models would be posted to the ISC website.

See Figure 1: Proposed Well Lines for Below San Acacia Surface Water/Groundwater Investigation.
(Separate file)

See Figure 2: Index Map of Proposed Well Lines.
(Separate file)

1.02 RELATIONSHIP TO SIMILAR PROJECTS IN ADJACENT AREAS

Rio Grande and Low Flow Conveyance Channel Modifications Draft Environmental Impact Statement (EIS)

Concurrent with this environmental review, the Bureau of Reclamation (Reclamation) is considering alternatives to realign the LFCC and the Rio Grande system to the west side of the Middle Rio Grande Valley below San Marcial (BOR, 2000a). The channel realignment would improve water conveyance to Elephant Butte Reservoir, valley drainage, sediment management and environmental conditions. This environmental analysis is ongoing, with completion of a final environmental impact statement and a decision expected by summer 2002. Any of the proposed alternatives for channel realignment would be implemented after the initiation of the proposed San Acacia Watershed Investigation, and any construction probably would not occur until after 2002 or 2003. The San Acacia Watershed Investigation would and could proceed independently of the actions proposed in the channel modifications EIS.

Temporary Channel into Elephant Butte Reservoir Project 2000 and 2002

The Bureau of Reclamation, with partial funding from the ISC, is constructing a temporary channel through the Elephant Butte Reservoir delta and into the reservoir pool to efficiently deliver sediment and water from the Tiffany, San Marcial, and upper delta areas further into the reservoir. The project area is in the delta zone of the reservoir's headwaters, approximately 45 miles south of Socorro, New Mexico, and 30 miles north of Elephant Butte Dam in Sierra County.

The project begins approximately 11 miles south of the Burlington Northern Santa Fe railroad bridge near San Marcial, New Mexico, and extends downstream to a point south of the Narrows. The Section 404 Permit is issued through December 31, 2003; all work associated with the project, including enhancement activities, is scheduled to be completed by this date. Construction work is ongoing, and the river channel is expected to re-connect with the reservoir pool by late 2003. The two projects are expected to proceed independently of one another.

Upper Rio Grande Basin Water Operations Review and EIS

The long-term operation of the Rio Grande system, including the LFCC, is being reviewed and analyzed in an EIS prepared by Reclamation, the USACE, and the New Mexico Interstate Stream Commission. The focus of this analysis is coordinating river operation to ensure that water contracts, compacts, and federal environmental obligations are met efficiently. Rio Grande Basin water operations are being analyzed comprehensively within the environmental review. This environmental analysis is ongoing, with completion of an EIS and a decision expected in 2004. The San Acacia Watershed Investigation would proceed prior to any decision and implementation of any of the current water operation alternatives proposed in the EIS. However, operational changes proposed in the EIS could be implemented in 2004 or 2005, potentially overlapping with monitoring activities proposed in the current Investigation. Monitoring activities would be fully coordinated to ensure consistency, but would not be expected to interfere with any operational changes. In fact, data gathered from the Investigation would be available to the URGWOPS Review and EIS alternatives analysis.

Rio Grande Silvery Minnow Critical Habitat EIS

A Draft Environmental Impact Statement and a proposal for the Designation of Critical Habitat for the Rio Grande Silvery Minnow was released for public comment in June of 2002 (USFWS, 2002). The proposed alternatives all include designation of the entire riverine areas included in the project. The EIS evaluates potential social, economic and biological impacts of designation.

1.03 REGULATORY COMPLIANCE

This EA was prepared by SWCA, Inc. Environmental Consultants in compliance with all applicable Federal Statutes, Regulations, and Executive Orders, including the following:

- American Indian Religious Freedom Act of 1978 (42 USC 1996)
- Archaeological Resources Protection Act of 1979 (12 USC 470)
- Clean Air Act of 1972, as amended (42 USC 7401 *et seq.*)
- Clean Water Act of 1977, as amended (33 USC 1251 *et seq.*)
- Endangered Species Act of 1973, as amended (16 USC 1531 *et seq.*)
- Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, 1994 (Executive Order 12898)
- Floodplain Management, 1977 (Executive Order 11988)
- National Environmental Policy Act of 1969, as amended (42 USC 4321 *et seq.*)
- Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500 *et seq.*)
- National Historic Preservation Act of 1966, as amended (16 USC 470 *et seq.*)
- Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001 *et seq.*)
- Procedures for Implementing NEPA (33 CFR 230; ER 200-2-2)
- Protection and Enhancement of the Cultural Environment, 1971 (Executive Order 11593)
- Protection of Wetlands, 1977 (Executive Order 11990)

This EA also reflects compliance with all applicable State of New Mexico and local regulations, statutes, policies and standards for conserving and protecting the natural and cultural environment.

2. DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.01 FUTURE WITHOUT ACTION (" NO ACTION")

The San Acacia Reach of the Rio Grande is very important due to the complex social, legal, economic and regulatory commitments for water in the Middle Rio Grande. This reach is currently managed by multiple agencies without comprehensive information on the groundwater component of the water balance. Lack of scientific data on the interaction of surface water and groundwater limits the ability of water managers to effectively manage the highly variable water supply to meet the demands of irrigators, municipal use, wildlife habitat, endangered species issues, and Rio Grande Compact delivery obligations.

Groundwater monitoring wells exist in the area, however these wells are owned by a number of different landowners and government agencies. Data is collected from these wells irregularly and their locations are not necessarily related to underlying geology, surface water hydrology or other factors relevant for trend analysis. Data from the private wells is rarely collected by the owner and when it is collected, it is usually not shared with the public, water management agencies or with other adjacent well owners. Data from wells owned by the government agencies is collected only sporadically and is utilized for various purposes.

2.02 ACTION ALTERNATIVE

2.02.1 Transect Locations and Well Access

The Rio Grande Watershed Study, Phase 1: San Acacia Surface Water/Groundwater Investigation (Investigation) is funded by the State of New Mexico and the Federal government under the authority of Section 729 of the Water Resource Development Act of 1986. Its expected cost is estimated at $1,093,000. All aspects of planning, National Environmental Policy Act (NEPA) compliance, property access, and permitting are expected to cost $200,000, well installation is expected to cost $520,000, three years of monitoring would cost $250,000, leases would cost $12,000 and overall management costs would be $111,000. The Investigation would characterize and evaluate the surface water and groundwater interactions along the Rio Grande from the San Acacia Diversion Dam to the headwaters of the Elephant Butte Reservoir. The Investigation would involve soil borings, wells, and staff gages constructed along seven transect lines that cross the Rio Grande and LFCC as shown in Figures 3A and B through 9A and B.

A total of seven transect lines were selected for investigation of the surface water-groundwater interaction, based on geomorphology and geological conditions of the San Acacia Reach. Transects are located below the San Acacia Diversion Dam at San Acacia (SAC), Escondida Bridge (ESC), Highway 380 (HWY), Brown Arroyo (BRN), South Border of the Bosque del Apache (SBB), San Marcial (SMC) and South Fort Craig (SFC) (see Figure 2).

Between six and 14 boreholes with 12 to 15 individual wells would be installed along each of these seven transects to maximize the scientific value of the investigation. To access most drilling sites, a roadway or cleared ground would be required for the ingress and egress of a

See Figure 3A: San Acacia (SAC) proposed point locations and access roads (topographic map).
(Separate file)

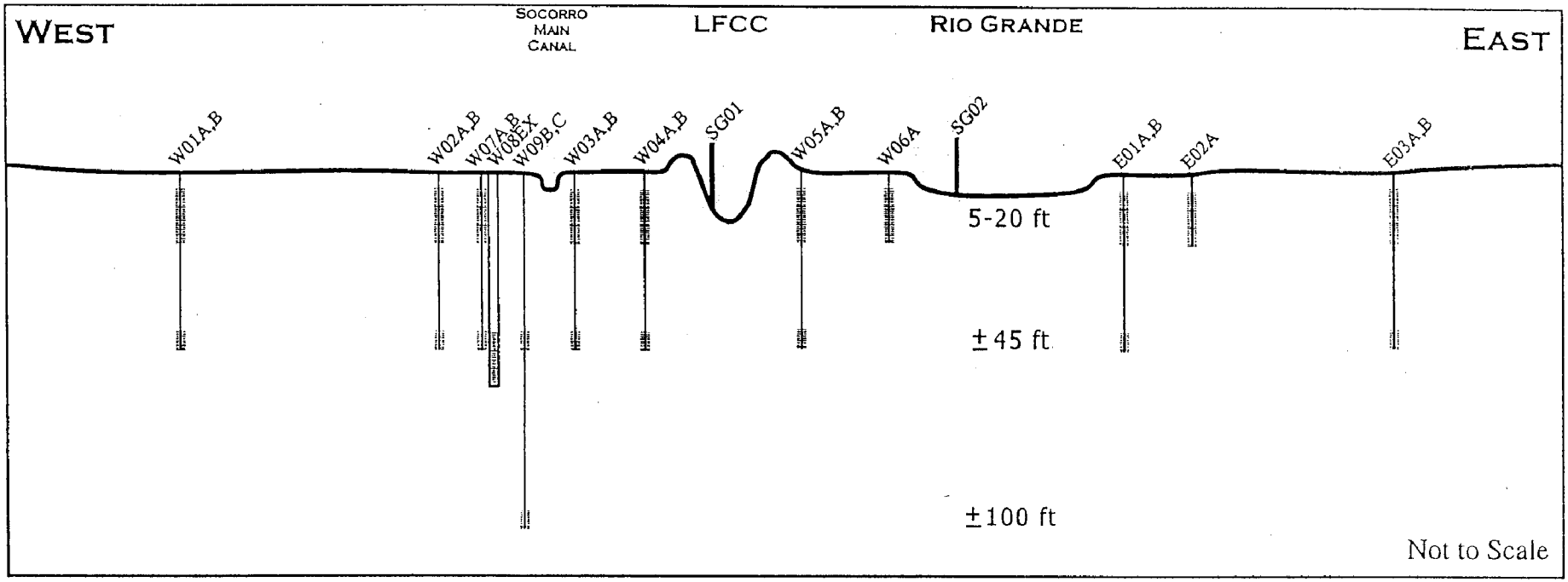

Figure 3B. San Acacia (SAC) well line - proposed drilling plan.

See Figure 4A. Escondida Bridge (ESC) proposed point locations and access roads (topographic map).
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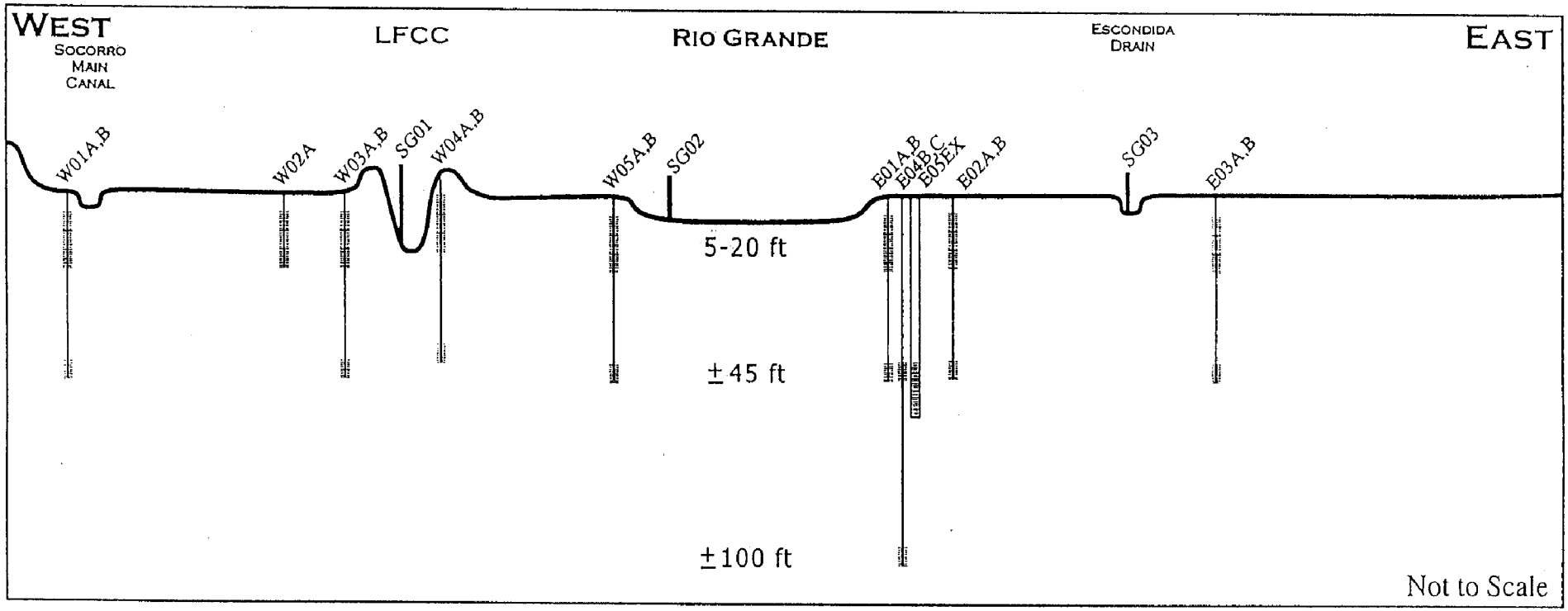

Note:	Offline well E06A,B will be located 20ft south of aquifer test well E05EX

Figure 4B. Escondida Bridge (ESC) well line - proposed drilling plan.

See Figure 5A. Brown Arroyo (BRN) proposed point locations and access roads (topographic map).
(Separate file)

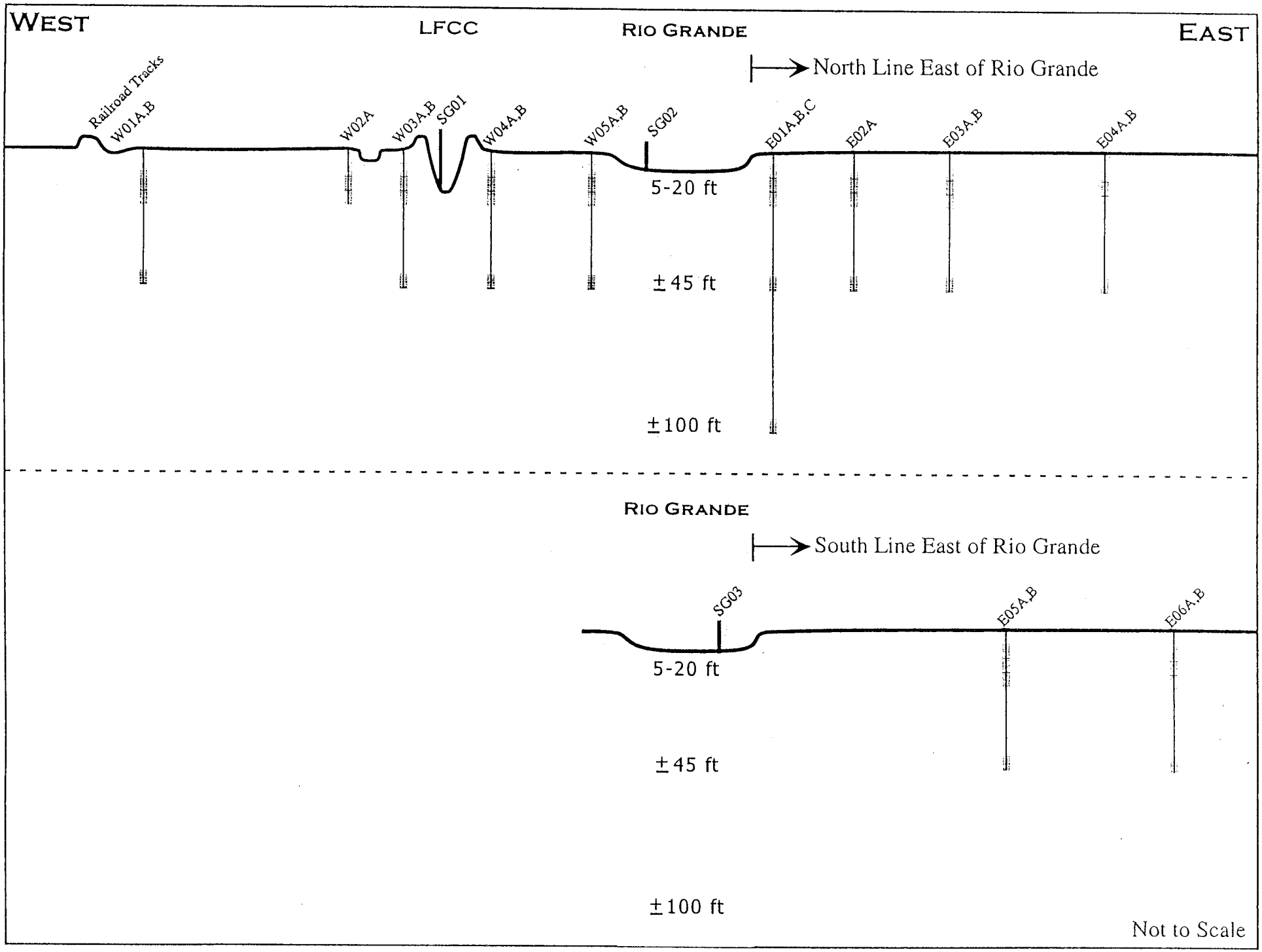

Figure 5B. Brown Arroyo (BRN) well lines - proposed drilling plan.

See Figure 6A. Highway 380 (HWY) proposed point locations and access roads (topographic map).
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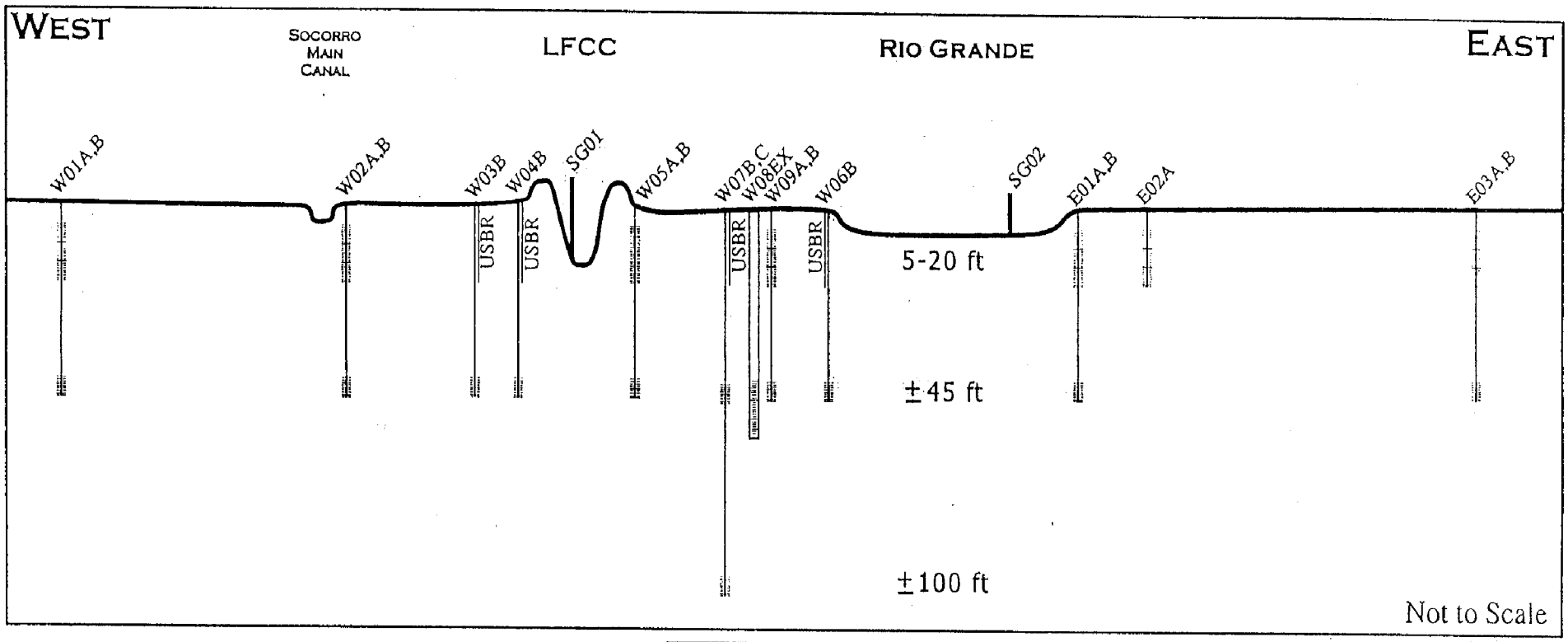

Note: Offline wells W10A,B and W11A,B will be located 60 ft south and 100 ft north, respectively, of aquifer test well W08EX

Figure 6B. Highway 380 Bridge (HWY) well line - proposed drilling plan.

See Figure 7A. South Boundary of Bosque del Apache (SBB)
proposed point locations
and access roads (topographic map).
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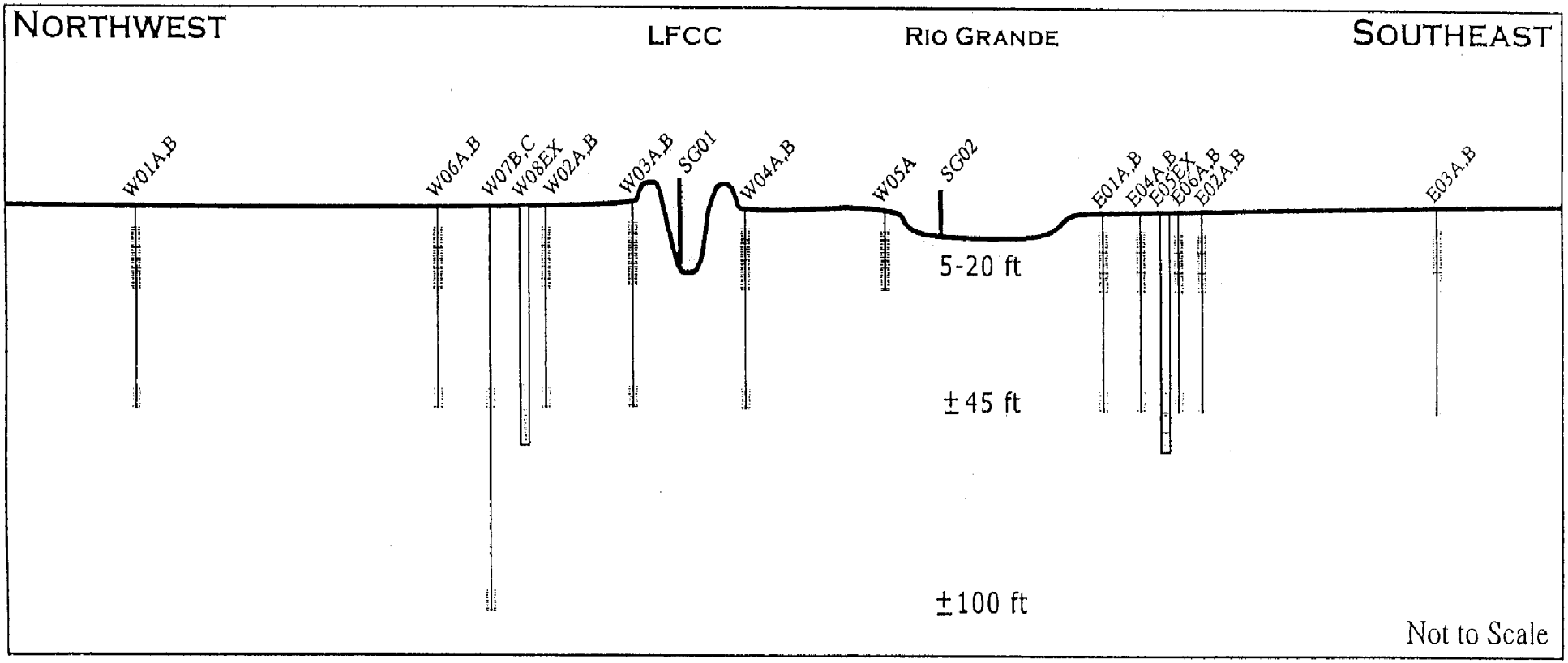

Figure 7B. South Boundary of Bosque del Apache (SBB) well line - proposed drilling plan.

See Figure 8A. San Marcial (SMC) proposed point locations and access roads (topographic map).
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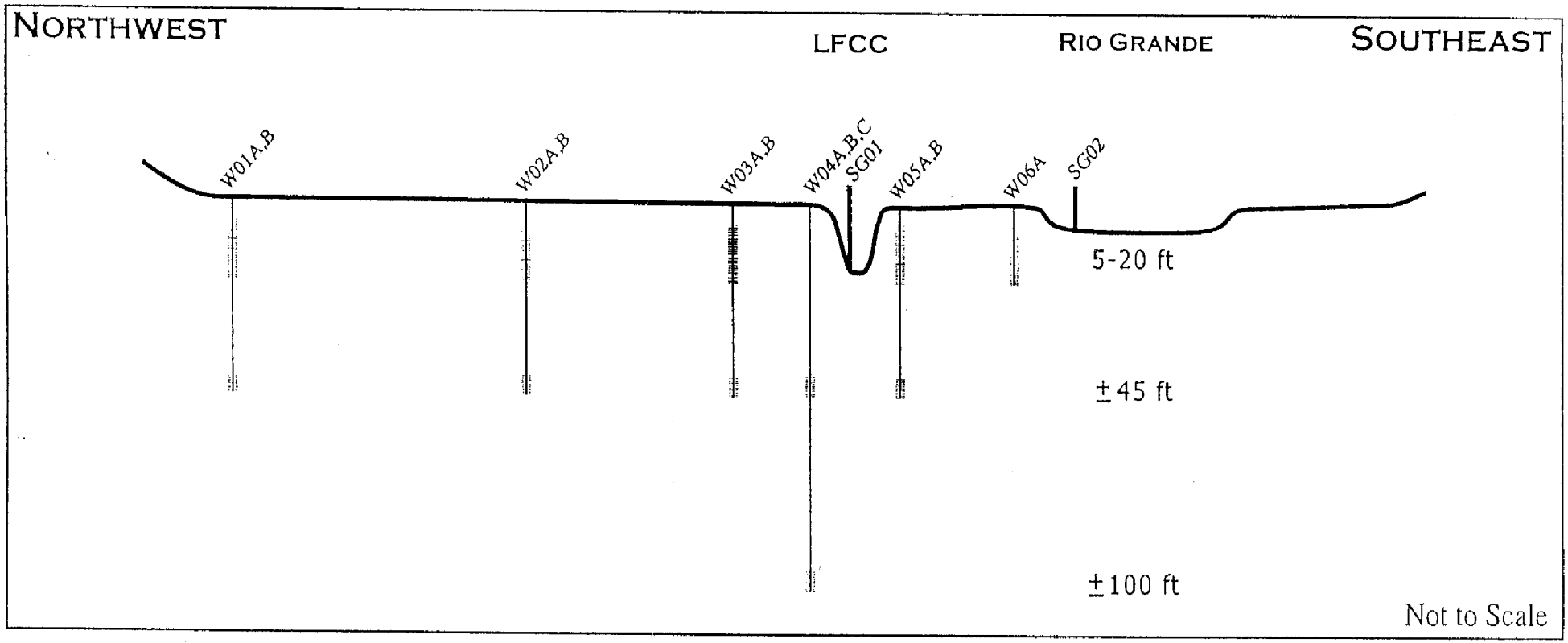

Figure 8B. San Marcial (SMC) well line - proposed drilling plan.

See Figure 9A. South Fort Craig (SFC) proposed point locations and access roads (topographic map).
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South of Fort Craig (SFC)

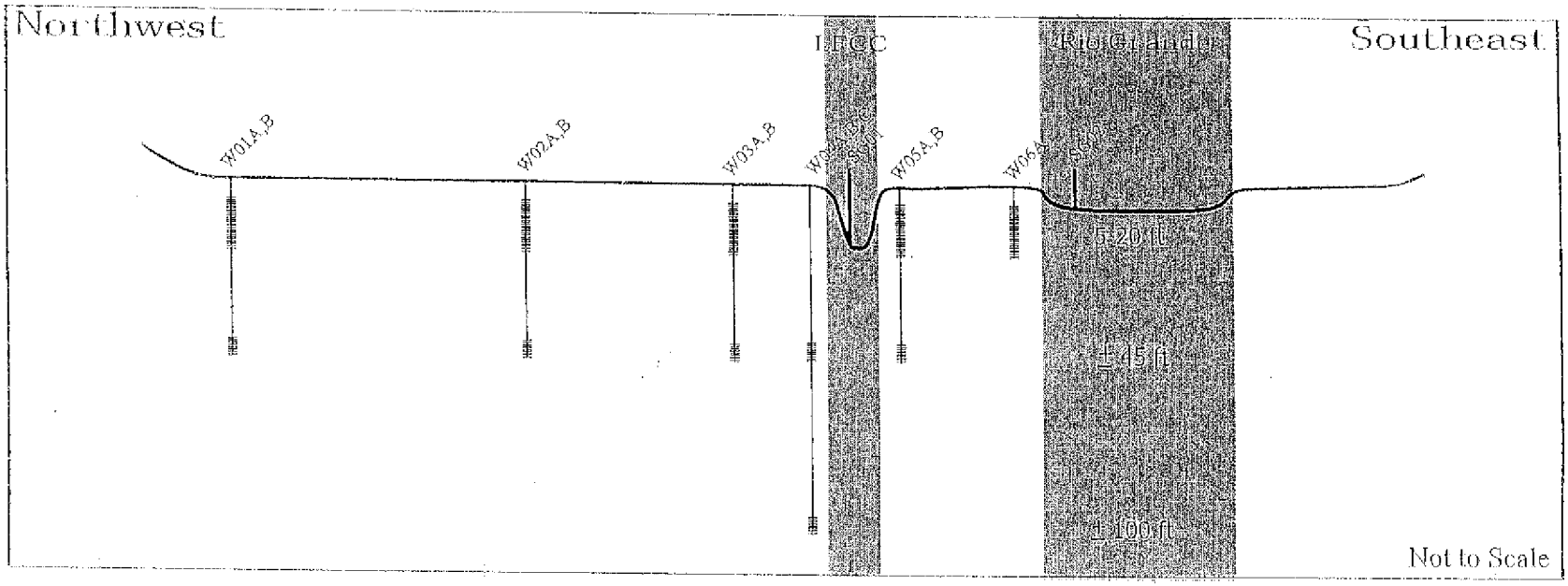

Figure 9B. South of Fort Craig (SFC) well line - proposed drilling plan.

drilling rig and support vehicles. A single deep exploratory well, up to 100 feet deep, would be installed at each transect for conducting detailed geologic logging. An 8 inch diameter extraction well would also be installed at each transect for conducting aquifer pumping tests. Drilling sites have been located whenever possible on or adjacent to existing roadways. However, at a few locations it would be necessary to clear existing growth from abandoned roadways or to clear vegetation around a roadway for vehicle access.

Access roads have been defined according to their development. Class 1 roads are improved gravel roads. Class 2 roads are unimproved roads that are graded and maintained, but not graveled. Class 3 roads are unimproved and un-graded, often called two-track roads. Class 4 refers to areas without established vehicular access that would require some clearing and improvement prior to use.

San Acacia (SAC) Transect Access

The access road locations are indicated on USGS topographic maps in figures 3B-9B. The western-most well (SAC-W01AB) would be accessed through a Class 2 road along the edge of a field. The extraction well location (SAC-W02AB, SAC-W07AB, SAC-W08EX, and SAC-W09BC) can be accessed via a short Class 4 road off the Class 1 road along the Socorro Main Canal. SAC-W03AB would be accessed via the Class 1 road along the west side of the agricultural fields. Wells SAC-W04AB and SAC-W05AB are located adjacent to the west and east LFCC roads, respectively. The SAC-W06A well is proposed to be installed by hand and would be accessed on foot from the upper east LFCC road.

Locations on the east side of the Rio Grande would be accessed using non-motorized methods to transport a small, portable drilling rig across the San Acacia Diversion Structure. A Class 3 abandoned road would be used from the diversion structure to the proposed well locations along the east side of the river. This access road may require minor clearing of vegetation in two distinct locations. Once at the well line, a Class 4 road would need to be established, however, little to no clearing would be required along the route since the area is an open field. Minimal clearing would be required to access the SAC-E01AB location.

Escondida (ESC) Transect Access

Class 1 roads would access all locations except ESC-W02A, ESC-W03AB, and ESC-E03AB where access would be via Class 2 routes. The area around Escondida Bridge is extremely open and little to no clearing would be required to access the proposed locations.

Brown Arroyo (BRN) Transect Access

The west side of Brown Arroyo would be accessed via the west side LFCC road (Class1). There is a bridge crossing the LFCC at the site to access the east side of the LFCC. Well BRN-W01AB may be accessed via a Class 2 road through an open agricultural field. There is no established road from the west side LFCC road to BRN-W05AB and Class 4 access is proposed. All other sites on the west side of the Brown Arroyo site are accessible via Class 1 roads. The east side of the Brown Arroyo site lies off of the Class 1 improved dirt road through Bosquecito from Highway 380. Wells BRN-E04AB and BRN-E06AB are located along this original unimproved road that would be accessed from the north. The route begins as Class 2 and changes to Class 3 several hundred feet past the BRN-E04AB location. Another Class 2

unimproved road exists heading west to a large clearing along the east bank of the river where wells BRN-E01ABC, BRN-E02A, and BRN-E03AB are proposed. At the south end of the clearing is a Class 3 abandoned road that provides access to the BRN-E05AB well location.

Highway 380 Bridge (HWY) Transect Access

The western-most well (HWY-W01AB) can be accessed from an improved road to within several hundred feet of the site and then via Class 2 roads through agricultural fields. The HWY-W02AB proposed location is on the edge of a Class 1 road. Well HWY-W03B is adjacent to a Class 2 unimproved road near a USBR well location. Well HWY-W04B is off the west LFCC road. All other wells on the west side lie immediately off the LFCC east road or along a short Class 2 road used to access USBR wells in the same location.

Along the east side, wells HWY-E01AB and HWY-E02A are located in a small clearing near the riverbank. Access is via a Class 3 and Class 4 abandoned road off of Highway 380 to the clearing. The Class 4 route is necessary to avoid getting too close to the riverbank and to avoid low hanging branches of a cottonwood tree. Well HWY-E03AB may be accessed via a Class 4 road due east from the HWY-E02AB location.

South Boundary of Bosque del Apache (SBB) Transect Access

Wells along the west side of SBB would be accessed via the Class 1 east side LFCC road and a bridge across the LFCC at the boundary. Wells SBB-W01AB, SBB-02AB, SBB-06AB, SBB-07BC, and SBB-08EX would be accessed via Class 2 roads into a clearing. Wells SBB-W03AB, SBB-W04AB, and SBB-W05A can be accessed along the west and east LFCC roads, respectively.

Access to the east side would be through county roads along the east side of the Rio Grande initially accessed from Highway 380 and passing by the Val Verde site. At the well line, a Class 2 road exists parallel and immediately outside of the Bosque del Apache boundary fence.

San Marcial (SMC) Transect Access

All wells along the SMC well line can be accessed via Class 1 improved roads including the east and west LFCC roads and maintained spurs of the road to the east and west. Wells would be placed immediately off a well-established, well-traveled roadway. All of the well sites within this line are on the west side of the river. The sites are located immediately adjacent to well-developed and traveled roadways.

South of Fort Craig (SFC) Transect Access

The SFC-W01 well location can be accessed via a Class 1 and Class 2 road along the east side of the fence adjacent to gravel pits. The access changes to Class 4 immediately before reaching the well location. Wells SFC-W02AB and SFC-W03AB can be accessed off the west LFCC road by establishing a Class 4 road to the locations. The SFC-W04ABC well is adjacent to the Class 1 west LFCC road. The SFC-W05AB well is located adjacent to the east LFCC road and SFC-W06A would be installed manually and would be accessed on foot.

2.02.2 Scheduling of Construction and Monitoring Activities

Drilling, well construction, well development, and aquifer testing would cause the greatest disruption in terms of both noise levels and time required to perform the tasks. Installation of the wells would occur between September 2002 and March 2003. Normal monitoring activities, which include groundwater sampling and water level measurement, require less time and generate less noise. Well monitoring would be conducted at regular intervals during the year over three years. Aquifer testing would be conducted during 2003.

2.02.3 Drilling and Well Development

Drilling and well construction require the use of a motorized drilling rig. During these activities, a motorized drilling rig is normally operated for all phases of the work. A large diesel motor powers the specialized equipment that turns or hammers the string of drilling pipe being advanced into the ground and that operates the many winches required to lift, lower, and move around various pieces of equipment and tools. For this work it is anticipated that hollow-stem augers, which are rotated into the ground, would be utilized to install most of the wells. For the deep wells, alternative drilling methods, such as rota-sonic or reverse-circulation dual-tube percussion, may be employed. Noise output from the drilling rigs and supporting machinery, as based on manufacturers specifications and measured within a 21-foot radius, is estimated to be between 75 and 100 decibels.

Soil samples would be collected from most boreholes as the drilling pipe is being advanced. If split-barrel sampling is conducted, or if percussion drilling is employed rather than auger drilling, the work would include staccato sounds of pounding steel against steel. For split-barrel sampling, the pounding is intermittent with one hundred blows or less being struck whenever samples are being collected. The sampling does not occur as the drill string itself is being advanced into the ground. If percussion drilling is employed, then hammering is the mechanism by which the drill pipe is advanced, and the noise is more pervasive. The percussion drilling, and certain other methods that are not likely to be used in this work, also require the use of large air compressors. Sound levels from operation of the diesel motors, air compressors, and hammering devices are not currently available; however, workplace safety requirements specify the use of hearing protection for personnel at the drilling sites.

The development of the wells is a one-time event. The equipment and development method(s) used and the time required would depend on the depth and type of well. Monitoring well development may be conducted with bailers and/or with small (less than 2-inch-diameter) pumps that may be either electrically or manually operated. A small gasoline powered generator is normally used to power the electric pumps. Drilling rigs or specialized pump support trucks are not necessary for this work, although they may be utilized if they are already on-site. Otherwise, a pickup truck is normally sufficient to supply necessary materials for well development. Development of the monitoring wells for this project should require less than one-half day per well. Water generated during development would be discharged to the ground near the well being developed in an area where it would not disrupt the ongoing work or nearby access ways.

Drilling rig types have not been specifically determined, but it is anticipated that sizes would range from drilling equipment mounted on the back of a one-ton truck to the use of rigs that are approximately twice as large. Most drilling sites would require enough space for a truck-mounted drilling rig to be parked and leveled. The rig used to install the deeper extraction wells may require the use of an accompanying support truck. A relatively clear area at the back of the drilling rig – approximately 12 feet by 12 feet – would be required for the crew to work around each borehole. Two pickup truck/SUV size vehicles would also be present at most drilling locations.

Typically one or two boreholes would be advanced at a drilling site, except at sites where aquifer test wells would be located. At sites where aquifer test wells would be installed, several additional boreholes would be located within approximately 75 feet of the aquifer test well. Figure 10 shows hypothetical locations of monitoring wells in the vicinity of an aquifer test well. The dashed lines indicate the approximate amount of open space required at each test well location. A preliminary estimate of the acreage that may require driving over or clearing of vegetation is 5.46 acres for the entire drilling program, as discussed in section 4.6.

Soil generated during drilling operations would either be left at areas near the boreholes, if acceptable to the landowner, or thin-spread in the vicinity of the boreholes. In accordance with the Clean Water Act, drilling spoil would only be deposited on upland locations. Water would be generated when wells are developed or groundwater samples are collected. This water would be discharged to the ground in areas away from work zones or roadways. If an aquifer test is conducted in a well, water would either be discharged to the Rio Grande or to the LFCC, in accordance with the National Pollutant Discharge Elimination System (NPDES) permit regulations or discharged to the ground in areas away from work zones or roadways.

All monitoring and aquifer test wells would be installed with locking surface protective casings to minimize the potential for damage to the wells. Schematics of the type of constructions that would be used are shown in Figures 11A-C. If the wells are located at the edges of established roadways, or in other areas where there is likely to be vehicular traffic, guard posts would be installed around the wells to protect them. The guard posts would be constructed of 3-inch diameter steel pipe filled with concrete and secured in the ground with concrete.

Staff gages will be installed in surface water bodies at up to 25 locations in order to measure surface water elevations. At each well line, staff gages would be installed in the main channel of the Rio Grande and the LFCC. Additional staff gages may be located in adjacent drains depending on the well line. The staff gages would be graduated every 0.01 foot and marked every 1.0 and 0.1 foot. They would be 2.5 inches wide and constructed of an iron frame coated with baked enamel. The height of the staff gage would depend upon the anticipated stage conditions at the location where the gage would be installed. Staff gages would be secured to a 1.5-inch-diameter steel pipe placed in the river or canal bed and oriented such that the graduations are visible from the bank. The steel pipe would be driven to a depth of approximately 6 feet below the river or canal bed, or to the point of refusal, whichever is less, using a manual slide hammer. Periodic surveying of the staff gages would be conducted to

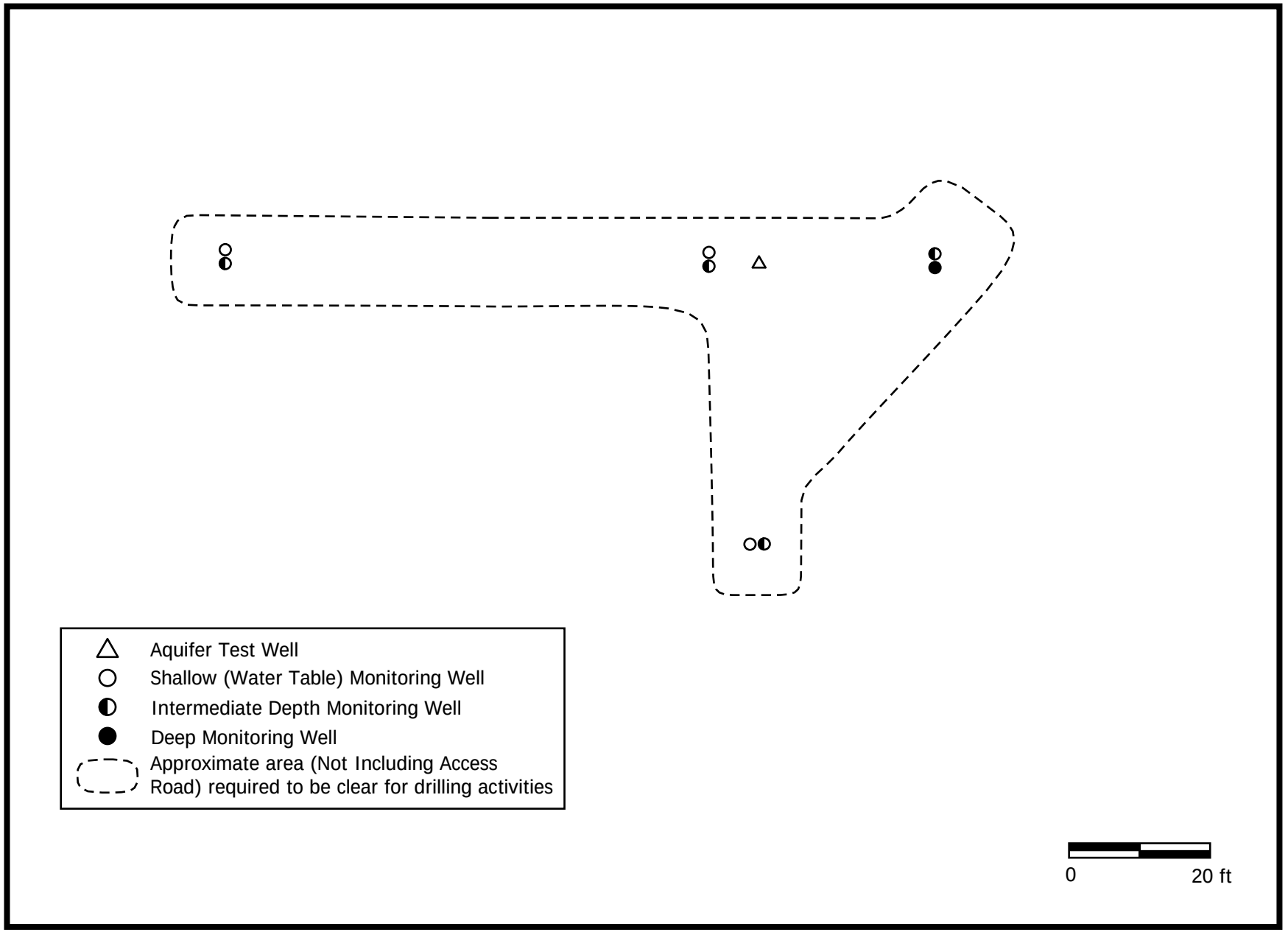

Figure 10. Hypothetical monitoring well locations adjacent to aquifer test well

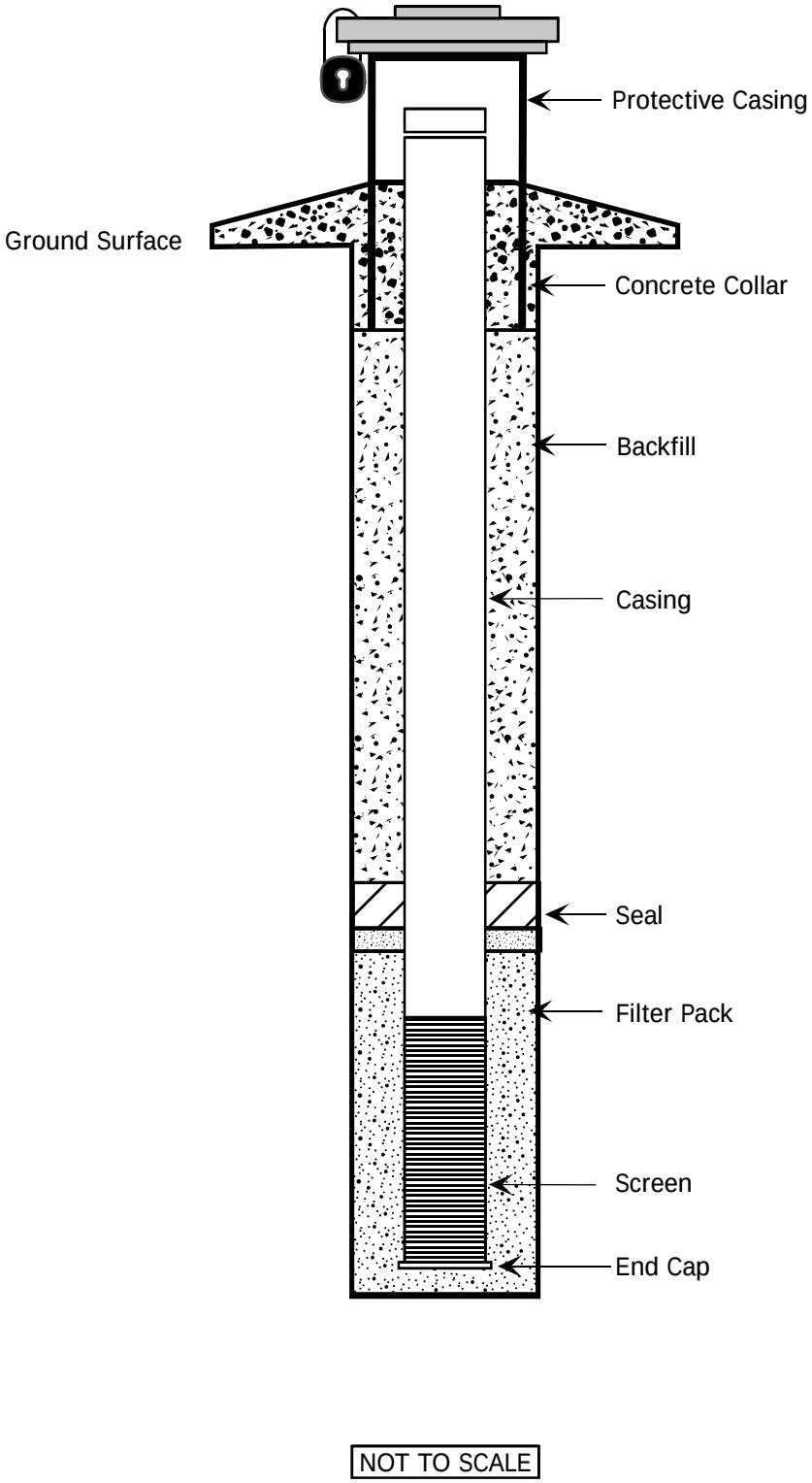

Figure 11A. Well Construction Diagram for Single Monitoring Well With Protective Casing

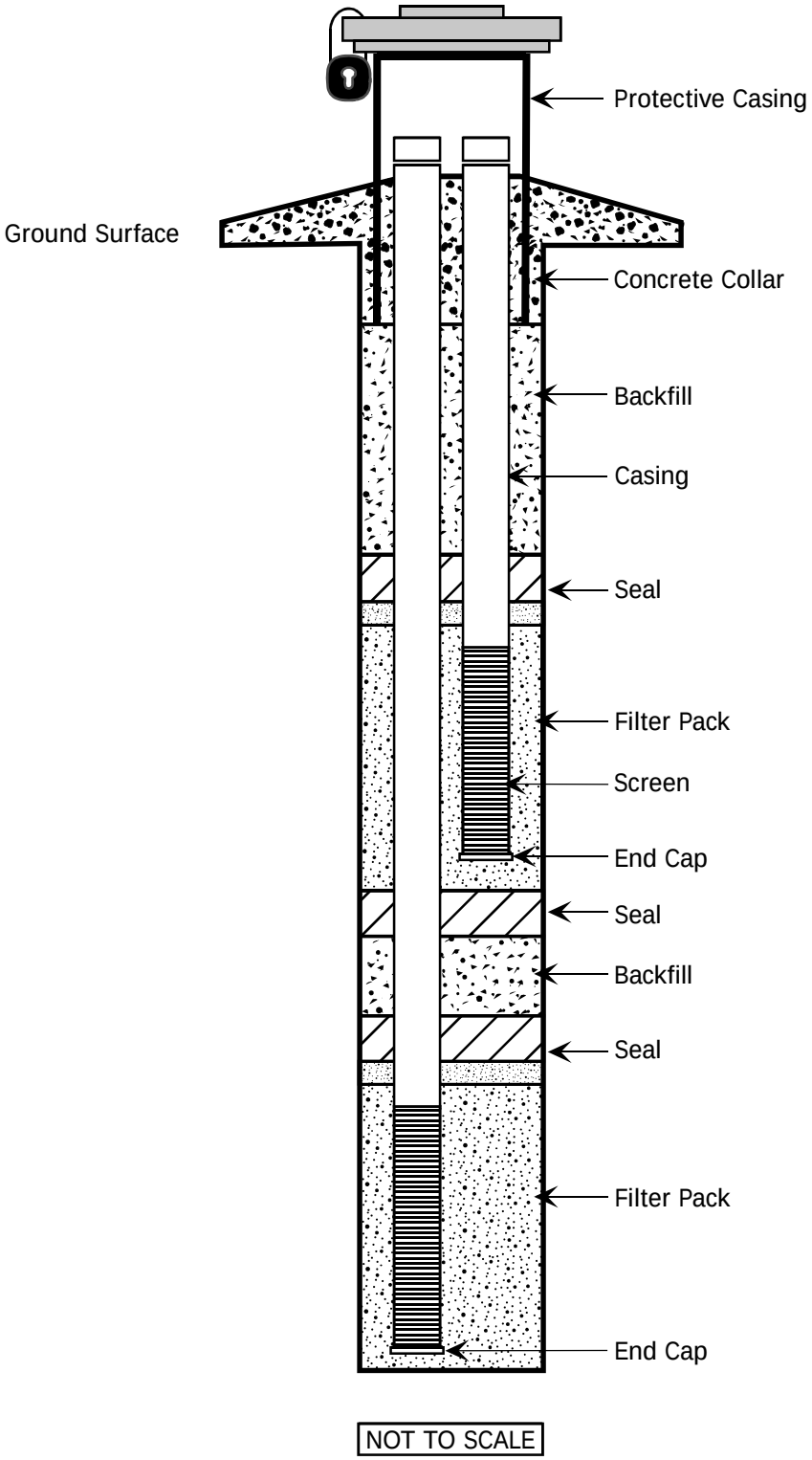

Figure 11B. Well Construction Diagram for Nested Monitoring Well with Protective Casing

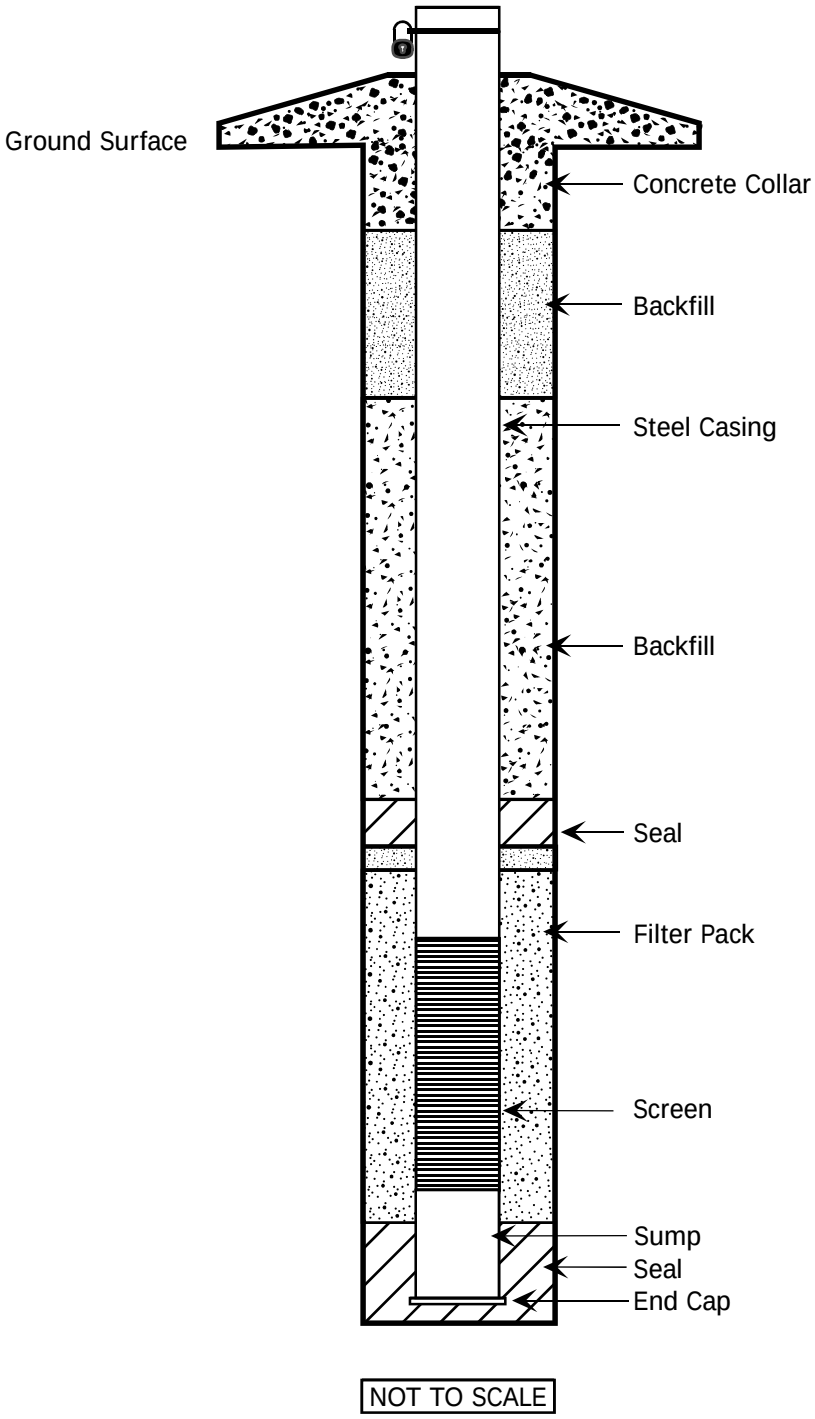

Figure 11C. Well Construction Diagram for Single Monitoring Well Without Protective Casing

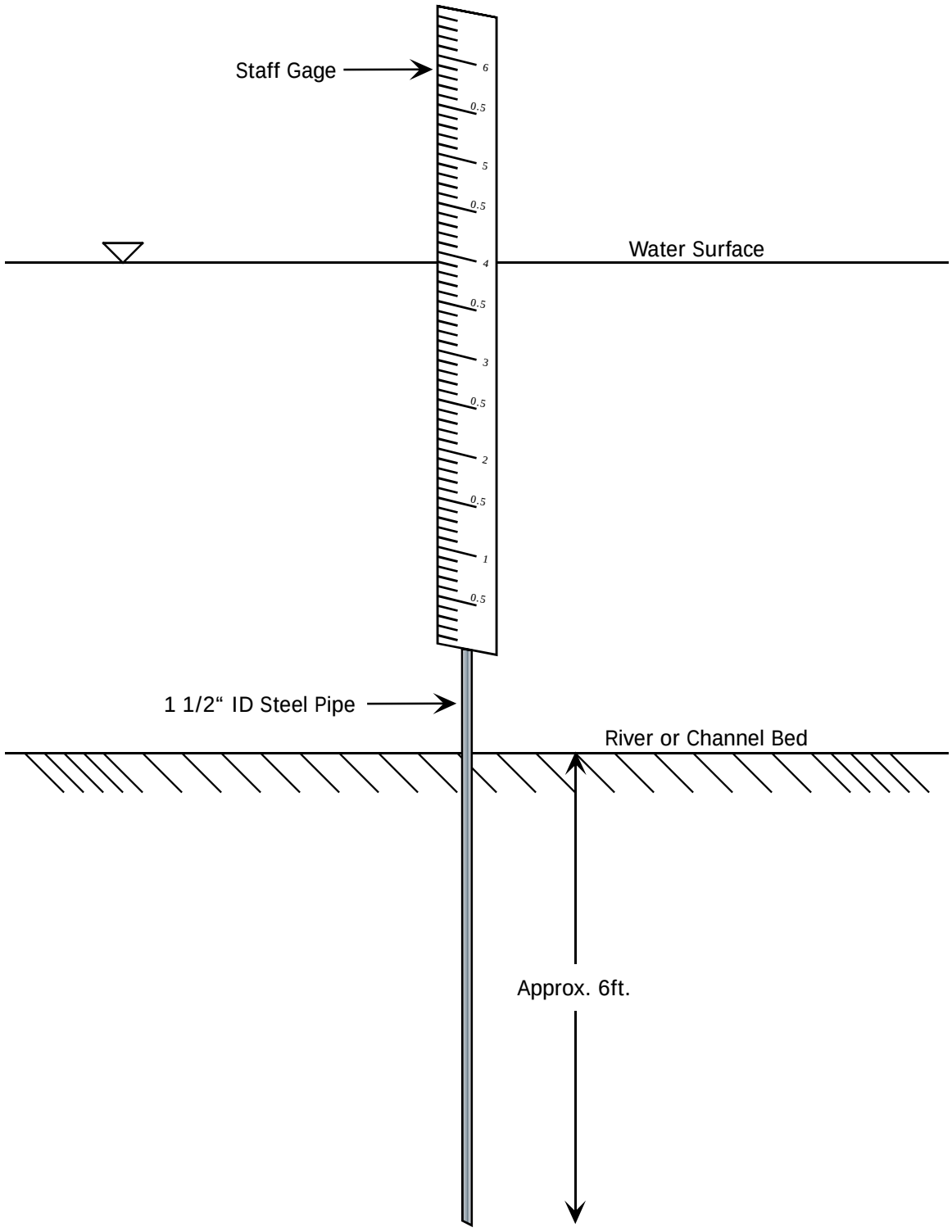

Figure 12. Staff Gage Construction Diagram

verify their elevations and to clear any accumulated debris. A generalized schematic of a staff gage installation is shown in Figure 12.

2.02.4 Aquifer Testing

Up to six aquifer pumping tests may be conducted as part of the program. The equipment that would be employed for these tests would be the same as for the development of the aquifer test wells: a pump support truck, a diesel-powered generator, and an electric pump and associated drop pipe that conveys water up from the pump and out of the well. Additional equipment would include hose or piping to direct the pumped water to the nearest outfall location, flow meters, and water level measurement devices or data loggers to monitor water levels in the wells in the vicinity of the test well while the test is being conducted.

The development of aquifer test wells would require the use of a pump support truck with a boom and winch for installing and removing pumps and drop pipes. A generator (usually diesel-powered) would be used to operate electric pumps that are normally used for this work. Since the aquifer test wells are larger diameter than the monitoring wells and it is critical that a very thorough development be performed, the time to complete the development of these wells may be up to a full workday. During the majority of this time the generator would be running. The diesel generators used for this type of work usually are very quiet, generally generating no more noise than an idling diesel-powered truck. Water generated during the drilling of aquifer test wells would be discharged onto nearby surface areas.

At the beginning and end of an aquifer test, several vehicles may be present at the drill site. These would include the pump support truck and an additional support vehicle, usually a pickup truck or small flatbed truck, and two or so additional pickup trucks/SUVs used by the personnel installing and using the water level measurement devices and monitoring the overall operation of the test. After the first few hours of operation of the aquifer tests, vehicles at the test site would vary. A pump support vehicle would be at the site only to service or fuel the generator. If a test is being monitored constantly, an additional vehicle would be at the site at all times; otherwise the vehicle would be at the site on a periodic basis to ensure that the test is operating normally and to collect periodic pumping information and water level measurements. Test durations may range from 24 hours to 7 days – the specific aquifer pump testing program cannot be determined prior to the initial extraction results.

Pumping duration and rates would vary from location to location and would depend on the subsurface conditions encountered where the pump test wells are installed. In the Rio Grande Valley in Socorro County, well information from the U.S. Geological Survey (USGS) shows well pumping yields ranging between 70 and 2,700 gallons per minute (Roybal, 1991).

The disposition of groundwater generated during aquifer tests would depend primarily on whether a test is conducted on the east or west side of the Rio Grande. Unless the landowner approves discharge onto the land surface, groundwater from tests conducted west of the Rio Grande would be discharged into the LFCC. Where this is not practical, and for all tests conducted east of the Rio Grande, alternate discharge locations would be selected. Table 2 provides specific details for the discharge of water for each test. Note that if water is to be discharged to the ground surface or to a dry canal or drain, the actual point of discharge would be

several hundred feet or more from the pumping well to ensure that recharge does not affect the results of the test. Water would be discharged to the Rio Grande only if water quality samples collected from the pumping well or one of the adjacent observation wells indicates that the groundwater is of better quality than the water in the Rio Grande. For all tests, water quality samples would be collected periodically during pumping. Real time pH, electrical conductivity, dissolved oxygen, and temperature measurements would ensure that water quality during the tests does not degrade significantly. Applications have been submitted for the NPDES permits required for discharging water to surface water bodies of the United States.

Table 1. Locations of Proposed Groundwater Discharge Points.

Well Line and Pumping Well ID	Distances to LFCC, RG, Other Nearest Waterways	Proposed Discharge Point and Distance to Discharge Point
San Acacia: SAC-W08EX	LFCC: 1100 ft RG: 1500 ft Socorro Main Canal: 300 ft	1. Socorro Main Canal: 300 – 1000 ft 2. LFCC: 1100 ft
Escondida Bridge: ESC-E05EX	LFCC: 800 ft RG: 150 ft Escondida Drain: 800 ft	1. Escondida Drain: 1000 ft 2. RG[1]: 150 ft
Highway 380 Bridge: HWY-W08EX	LFCC: 350 ft RG: 200 ft	1. LFCC: 350 ft 2. RG[1]: 200 ft
South Bosque Boundary: SBB-W08EX	LFCC: 700 ft RG: 1600 ft Elmendorff Drain: 800 ft	1. Ground application on nearby private land 2. LFCC: 700 ft 3. Elmendorff Drain: 1200 ft
South Bosque Boundary: SBB-E05EX	LFCC: 1200 ft RG: 100 ft	1. Ground application: 1500 ft to South on private land 2. RG[1]: 100 ft
San Marcial: W08EX	LFCC: 1000 ft RG: 200 ft	1. LFCC: 1100 ft 2. RG[1]: 200 ft

[1] First choice for water disposition (assuming groundwater quality is acceptable if release is into Rio Grande)

2.02.5 Water Level and Water Quality Testing

Details of specific groundwater elevation or quality sampling programs have not been established, however, monitoring programs are anticipated. To sample the wells for water quality, some amount of water would be removed from each well prior to the collection of the sample. It is anticipated that the water would be removed by bailing or by the use of a small electrically or manually operated pump. The equipment would generally be the same as for the development of the monitoring wells, with at most the use of a gasoline powered generator being required. One vehicle would be required to convey personnel and equipment to conduct the sampling, and the sampling time for any monitoring would not be expected to exceed approximately two hours.

Measurement of water levels in the wells installed during this drilling program is anticipated to be a regularly scheduled activity. Over the course of the project water levels would be manually measured on a periodic basis (expected to be monthly to quarterly). Additionally, data loggers would be employed in a subset of the new wells for continuous water level measurement purposes and some event-specific water level measurements. Measurement programs are expected to correlate water level changes in specific monitoring wells with changes in stages in the Rio Grande and/or the LFCC in the vicinity of the wells. One or two people and one vehicle would be required to collect water level measurements and to install, retrieve and down load data loggers. Except for the installation of data loggers, these activities would require only a few minutes at each well. Data logger installation may require up to one-half to one hour per well. Normally, when water level measurements are collected and/or data loggers are down loaded, the vehicle would be parked at a central location and several wells would be accessed prior to moving the vehicle to another location. For event-specific sampling, more people and more vehicles may be involved and activities at any given well line may encompass several hours.

2.03 ALTERNATIVE PROJECT COMPONENTS CONSIDERED BUT ELIMINATED FROM FURTHER STUDY

Initial evaluation of the existing wells in the region was conducted in March 2001. Data from this reconnaissance was used to establish details of the program including transect locations, well locations, well construction and drilling methods, and access to the sites. Based on this information, two subsequent field investigations, one in April 2001 and the other in August 2001, were conducted to further refine the details of the Investigation.

In the preliminary investigations, a number of alternative project components, including transects, well locations, access routes, construction techniques and equipment types were considered but eliminated. The removal of the considered alternatives was based on three screening criteria: the project component's impact to biological resources; the project component's impact to cultural resources; and the project component's adherence to the purpose and need of the project. Table 2 lists the alternative project components considered and the reasons each component was eliminated.

Table 2. Alternative Project Components Considered but Eliminated.

Transects	Reason For Elimination
San Acacia	A downstream San Acacia transect location was removed from consideration since the data collected from the transect would not allow for cross-gradient water level information to be collected
San Marcial	An upstream San Marcial transect was eliminated because of the difficulty in accessing the site.

Transects, *continued*	**Reason For Elimination**
South Fort Craig	Transects along the power lines and the road to Fort Craig along the LFCC were considered but removed from consideration because of safety issues with the power lines and because of large amounts of vegetation that would need to be removed.
North Boundary of Bosque del Apache	A number of existing wells in this area precluded the need for an additional transect in this area.
Bosque del Apache	A number of existing wells in this area precluded the need for an additional transect in this area.
Well Locations	**Reason For Elimination**
Brown Arroyo Transect Wells	All wells on the west side were located south of the initial sighting to minimize impact to the biological resources.
Highway 380 Bridge Transect Wells	One well on the west side of the river was removed from further consideration due to land access issues.
South Boundary of Bosque del Apache Transect Wells	Well locations were moved west into areas recently cleared by the landowner to minimize impact to biological resources.
Alternative Access Routes	**Reason For Elimination**
San Acacia	Use of a Class 4 access road to well SAC-W06A was eliminated to minimize clearing of vegetation in the area. Access to the east side was restricted to non-motorized means to minimize the potential for impacts to the Sevilleta National Wildlife Refuge. Motorized river crossings were eliminated due to concerns about the impact to Rio Grande silvery minnow and other aquatic resources.
Brown Arroyo	Access changed to entrance from Highway 1 to minimize driving time and vegetation disturbance.

Alternative Access Routes	Reason For Elimination
Highway 380 Bridge	A portion of the access of the Class 3 road to the wells along the east side of the river was changed to Class 4 due to safety concerns and the potential for access to increase bank erosion along the abandoned roadway. Access to well HWY-03AB was changed to minimize clearing of vegetation.
South Boundary of Bosque del Apache	Motorized river crossings were eliminated due to concerns about the impact to Rio Grande silvery minnow and other aquatic resources. Access routes were also restricted to Class 1 and 2 roads to ensure no additional clearing of vegetation would be required.
South Fort Craig	Access to wells along the west side were more clearly delineated to minimize the clearing of vegetation along this route.
Alternative Well Installation Techniques	**Reason For Selection of Method**
Hand augering	A number of wells would be hand augered to minimize amount of vegetation that would need to be cleared to get a motorized vehicle to the site, and to reduce noise impacts in sensitive wildlife habitats.
Portable Drilling Rig	A small portable rig would be used to minimize potential impacts to biological and physical resources.
Motorized Drilling Rig	Motorized drilling rigs would be used in all transects except the east side of San Acacia. This choice is made for efficiency.

3. AFFECTED ENVIRONMENT

3.01 PHYSIOGRAPHY AND CLIMATE

The proposed project area lies within the long structural depression of the Rio Grande rift valley. This region is part of the Rio Grande Subsection of the Basin and Range physiographic province and is dominated by broad alluvial piedmont slopes and plains, as well as some low, isolated fault block mountains and ridges (Hawley, 1979). Elevation within the study area ranges from about 4,660 to 4,430 feet.

The climate of the Rio Grande valley is characterized as arid, with approximately 7.9 inches of precipitation per year. Most of this precipitation occurs during brief thunderstorms in the warmest months of the year as moist air is pushed up from the Gulf of Mexico. The average annual maximum temperature at the Socorro weather station is 74 degrees Fahrenheit (Johnson et al., 1985).

3.02 SOILS

The soils within the project area are generally classified as Typic Ustifluvents-Gila-Armijo. These are deep, floodplain soils that have formed in recent alluvium with slopes of less than 2%. (USDA, 1988). Specific soil types identified in the area are described below.

Gila Clay Loam. Deep, well drained, moderately permeable; surface layer is yellowish brown clay loam, light yellowish brown silt loam is below this; slightly saline, water erosion slight, wind erosion high; well suited as irrigated crop and pastureland. This soil type is present at the SAC sites east of the Main Canal.

Anthony Sandy Loam. Deep, well drained, moderately permeable; surface layer is light brown sandy loam, light yellowish brown loamy very fine sand below this; slightly saline, water erosion slight, wind erosion high; poorly suited as irrigated cropland, well suited as irrigated pastureland. This soil type is present at the SAC sites between the main canal and the LFCC.

Armijo Clay. Deep, well drained, slowly permeable; moderately saline, surface is brown clay, pinkish gray clay beneath; water erosion slight, wind erosion high; poorly suited as irrigated cropland, well suited as irrigated pastureland. This soil type is present at the extreme west sites within the ESC transect.

Saneli Clay. Deep, well drained, slowly permeable; slightly saline, surface is brown and light brown clay, pale brown loamy sand beneath water erosion slight, wind erosion high; poorly suited as irrigated cropland, well suited as irrigated pastureland. This soil type is present at the extreme west sites within the BRN transect.

Popotosa Clay Loam. Deep, well drained, moderately slow permeability; surface is light brown clay loam, light brown loam and clay loam beneath; water erosion slight, wind erosion high; suitable as irrigated cropland, well suited as irrigated pastureland. This soil type is present at the extreme west sites within the HWY transect.

Anthony-Gila Complex. Deep, well drained, variably permeable; surface is brown fine sand or pale brown fine sandy loam, pale brown loamy very fine sand or brownish and light yellowish brown very fine sand to silty clay loam beneath; water erosion slight, wind erosion very high; suitable for livestock grazing and wildlife habitat. This soil type is present west of the LFCC at the SBB, SMC, and SFC sites.

Typic Ustifluvents. Deep, poorly drained, variably permeable; there is not a typical profile, but the surface layer is commonly light brown fine sand, light brown to brown clay and silty clay loam beneath; water erosion slight, wind erosion high; subject to frequent flooding, main use is as wildlife habitat. This is the most common soil type in the study area and is found at all the sites not discussed above.

3.03 WATER RESOURCES

Water resources within the project area consist of the Rio Grande and its tributaries and groundwater supplies. Flows in the Rio Grande in this reach are highly variable and dependent on upstream dam releases, groundwater seepage, and storm events. USGS gauging stations at San Acacia (08354900) and San Marcial (08358400) provide two quantified points of reference for Rio Grande flows for the study area.

The State of New Mexico Standards for Interstate and Intrastate Surface Waters section 20.6.4.105 lists the designated uses for the reach of the Rio Grande within the study areas as irrigation, limited warmwater fishery, livestock watering, wildlife habitat, and secondary contact. Generally, water quality in this reach meets the standards set forth in section 20.6.4.105 of the State of New Mexico Standards and the reach has not been listed as impaired by the State of New Mexico. Specific water quality standards for the reach stipulate that in any sample pH shall be within the range of 6.6 to 9.0, and temperature shall not exceed 32.2°C. On average fecal coliform should not exceed 1,000 colonies/100 mL of water and no sample should exceed 2,000 coloinies/100 mL of water. Additional standards require that when mean monthly flows exceed 100 cfs TDS should not exceed 1,500 mg/L, sulfate should not exceed 500 mg/L, and chloride should not exceed 250 mg/L.

3.04 FLOODPLAINS AND WETLANDS

The entire project area lies within the historic floodplain of the Rio Grande. Each of the transects proposed contains one or more staff gages that lie within jurisdictional waters of the U.S. Because of the limited size of the disturbance in jurisdictional areas, a Section 404 Permit will not be required. The Rio Grande channel is highly aggraded in the project area, resulting in very few wetlands. The only extensive jurisdictional wetlands occur in the Cuates Canyon area and south of Fort Craig near the LFCC road, where a breach in the LFCC has added surface water to the floodplain. The transects selected for the Investigation would not intercept any of the wetlands in the study area.

3.05 AIR QUALITY AND NOISE

Currently, the Air Quality Bureau of the New Mexico Environment Department does not operate an air quality monitoring facility in Socorro County. The entire county is considered to be in attainment with all State and Federal air quality standards for, carbon monoxide, nitrogen dioxide, sulphur dioxide, ozone, lead, and suspended particulates smaller than 10 microns (EPA, 2002).

There is little development within most of the study area. Most of the ambient noise currently encountered in the area is generated by conveyance road traffic, the railroad, and occasional water-related construction or repair projects. There are four residences within 1,000 feet of a proposed well site. These residences are located as follows: 620 feet west of the western-most site in the SAC well line (SAC-W01AB); 239 feet west of the western-most site in the ESC well line (ESC-W01AB); 499 feet north of the second western-most site in the BRN well line (BRN-W02A); 761 feet south of the second western-most site in the BRN well line (BRN-W02A).

3.06 AESTHETICS

Many of the proposed well sites are in agricultural, highly disturbed, or denuded areas that offer little aesthetic appeal. The only unique vistas or overlooks in the project area are in and around the Bosque del Apache NWR and at Fort Craig. The proposed well lines are not visible from these sites.

3.07 VEGTATION COMMUNITIES

Historic trends in the riparian areas of the Rio Grande have resulted in considerable reduction and fragmentation of native stands of woody vegetation, and the project area is no exception. The proposed Investigation is a means of better understanding the hydrological factors that may be contributing to current riparian ecosystems and the evapotranspiration effects that the current riparian ecosystem may have on the water budget.

The San Acacia Reach contains approximately 30,000 acres of riparian vegetation; however, non-native saltcedar (*Tamarix* sp.) has infested over 35% (11,000 acres) of the riparian vegetation (BOR, 2000). Young successional stands of Fremont cottonwood (*Populus fremontii*.) encompass only 8% (2,500 acres) of the existing riparian habitat, indicating that little regenerative capacity exists for the native riparian vegetation in the area. In the area between the San Acacia Diversion Dam and Bosque del Apache NWR, stands of riparian woodlands are fragmented by numerous agricultural fields, pastures and roads. South of Bosque del Apache, the riparian woodlands are less fragmented, with occasional areas of continuous canopy.

Since the average annual precipitation of the Middle Rio Grande Valley in the study area is very low, riparian ecosystems depend on an adequate supply of groundwater and the ability of the river to periodically flood its banks and naturally alter its channel course. The frequency of successful establishment (recruitment) and extent (acreage) of young-aged native plants are indicators of the health of riparian habitats. Because of annual flow and climatic variability,

conditions favorable for recruitment and survival of riparian vegetation occur infrequently. Seedling establishment depends on a particular time sequence of overbank flooding. Specifically, it requires a flood year that would disperse the seeds and clear the riverbank followed by consecutive (2 or more) drier years that would allow the seeds to grow and establish without being scoured or drowned by the high velocity floodwaters.

The rate of river stage drawdown is also critical for seedling survival in both riparian and wetland habitats, especially during dry, hot summers. Adequate soil moisture must be maintained by groundwater and summer rains to allow seedling survival following germination. For example, studies at the Bosque del Apache National Wildlife Refuge documented that gradual reductions in flood flows resulted in a gradual decline in the water table and a higher survival of cottonwood and willow seedlings (Watts, 2001).

In addition to the cottonwood communities, the San Acacia Reach area contains some wet meadow and cattail marsh habitat. Vegetation in the cattail marsh depends on seasonally or permanently flooded conditions and is generally found in groundwater-fed depressions and outflow or breached areas of the LFCC. The seven transects selected for the Investigation do not contain either of these community types.

The overall vegetation of the study area contains extensive areas of native vegetation with diverse age structure and species composition, the specific transects selected for the proposed Investigation consists of agricultural lands and pastures with fragmented areas of highly to moderately disturbed riparian vegetation. Woody dominants include Fremont cottonwood, Tornillo (*Prosopsis pubescens*), Gooding willow (*Salix gooddingii*), Russian olive (*Elaeagnus angustifolia*), and seep willow (*Baccharis glutinosa*).

The SAC transect is composed of agricultural land and pasture on the west side of the Rio Grande, with a native riparian community occurring east of the channel. The ESC and BRN transects contain predominantly agricultural and pasture lands on both sides of the river. HWY transect contains a mixture of agricultural land and disturbed cottonwood woodlands. The SBB and SMC transects consist of disturbed pastures with considerable salt cedar and occasional cottonwoods. The SFC transect contains the most dense and diverse vegetation, with mid-aged mixed stands of cottonwood, Russian olive and salt cedar.

3.08 WILDLIFE

The increased diversity and productivity provided by riparian and wetland communities are particularly evident when compared to surrounding arid ecosystems in the Southwest. These areas are typically the only large wooded tracts in lowland areas providing protection and roosting sites for many species. Furthermore, the riparian zone is the only source of water for many fauna and therefore attracts numerous species. The San Acacia Reach supports high quality riparian habitat, providing important breeding habitats for all taxa of wildlife.

As many as 75 species of mammals have been noted in the study area, including mountain lion, black bear, coyote, desert mule deer, porcupine, beaver, badger, kit fox, swift fox, raccoon, skunk (BOR 2001). Several species of rodents occur, especially in pastures, agricultural fields, irrigation ditches and wet meadows.

The wooded riparian zone is also an essential migratory corridor for as many as 325 avian species. Migratory songbirds that use the area include Vermillion flycatcher, Western kingbird, Common yellow throat, Mourning dove, Red-winged blackbird, and Southwestern willow flycatcher. The area supports as many as 300 species of nesting waterbirds, the largest concentration in the Middle Rio Grande Valley (BOR, 2000a). These are numerous wherever there is standing water, especially in developed ponds in the Bosque del Apache National Wildlife Refuge, the Oxbow Lake, and Brushy Lake south of Fort Craig and include numerous species of ducks, geese and cranes, plus Pied-billed grebe, Neotropic cormorant, Great blue heron, Snowy egret, Great egret, Black-crowned night-heron, and Least bittern. Raptors include Swainson's hawk and Bald eagle.

A recent study of fish and herptile species in the project area has been conducted by the Bureau of Reclamation (BOR, 2000b). This study indicated that 14 herptile species occur in the project area including Woodhouse's toad, red-spotted toad, Great Plains skink, checkered whiptail, New Mexico whiptail, and side blotched lizard. Common fish identified in this study included mosquitofish, red shiner, gizzard shad, channel catfish, yellow bullhead, white bass and largemouth bass, green sunfish, river carp sucker, and common carp, as well as Rio Grande silvery minnow.

3.09 SPECIAL STATUS SPECIES

In Socorro County, 10 plant and 58 wildlife species are currently listed as Threatened, Endangered, Sensitive, or Species of Concern (TES). The proposed project area does not contain suitable habitat for any of the TES plant species known to occur in Socorro County, however, 30 TES wildlife species were identified as having the potential to occur in riparian areas along the Rio Grande, as summarized in Appendix A. Three of these species, the Rio Grande silvery minnow (*Hybognathus amarus*), the southwestern willow flycatcher (*Empidonax traillii extimus*), and the bald eagle (*Haliaeetus leucocephalus*), are protected species considered likely to occur in the project area.

3.09.1 Rio Grande silvery minnow (*Hybognathus amarus*)

The Rio Grande silvery minnow is a federally and state-listed endangered species. The silvery minnow lives in large plains river habitats, and a flowing mainstem environment is required for the survival of the species. Adults generally prefer habitats in large streams with a low gradient, a shifting sandy or silty bottom, and slow to moderate current. The larvae occupy shallow, low velocity areas characterized by high water temperatures and elevated primary productivity that provide good conditions for development and growth.

The Rio Grande silvery minnow formerly was one of the most widespread fishes in the Rio Grande basin. The historic extent of the species stretched from Española to the Gulf of Mexico, including the Pecos River. Currently, the silvery minnow occupies only a small fraction (5%) of its historic range. The silvery minnow has been extirpated from portions of the Rio Grande and the entire Pecos River. Its range along the Rio Grande in New Mexico is currently limited from Cochiti Pueblo downstream to the headwaters of Elephant Butte Reservoir. Three diversion dams are located within this reach and prevent the return of the silvery minnow to upstream habitats. Within its remaining habitat, the silvery minnow is most prevalent

downstream from the San Acacia Diversion Dam, which is also the stretch of river most susceptible to surface-water depletion.

Upstream and downstream dispersal play an important role in the life history of the silvery minnow, and the fragmentation of the river by storage and diversion dams has disrupted the connectivity of its habitat. These barriers to upstream adult movement, coupled with the loss of back-water habitats for retention of drifting larvae, have resulted in a situation where a large proportion of the species' reproductive output may be lost to downstream displacement of larvae into unsuitable reservoir habitats. Furthermore, consecutive years of low flows severely affect the viability of the silvery minnow, particularly when the river channel dries completely and large numbers become stranded and die. Below average flows of two years or more have the potential to eliminate this short-lived species from the drier reaches of the river (NMDGF, 2001a).

3.09.2 Southwestern willow flycatcher (*Empidonax traillii extimus*)

The southwestern willow flycatcher is a U.S. Fish & Wildlife Service (USFWS) and New Mexico Department of Game and Fish (NMDGF) Endangered species. The southwestern willow flycatcher principally occurs in dense riparian vegetation and prefers dense willow groves with a sparse overstory of cottonwood. It is also associated with arrowweed (*Pluchea sericea*), buttonbush (*Cephalantus* sp.), tamarisk, Russian olive, and some other riparian vegetation.

During the breeding season of approximately April 15 through August 15, Southwestern willow flycatchers are restricted to riparian woodlands. The breeding habitat for the species varies across its range, while its general habitat is composed of riparian woodlands with very dense understory vegetation with tall or moderately tall overstory and small, interspersed openings. During the spring and fall migration, willow flycatchers are more commonly found in willow habitats than in other vegetation types (USFWS, 2001b). The species overwinters in Central and South America. Regardless of the season, southwestern willow flycatchers are typically found in habitats within 150 feet of a water source.

The historic range of southwestern willow flycatchers included Arizona, California, Colorado, New Mexico, Texas, Utah, and Mexico (Federal Register, 1994). In New Mexico, the flycatcher principally occupies riparian habitat along the Rio Grande, Rio Chama, Zuni, San Francisco, and Gila River drainages. On the Rio Grande, its breeding range has been restricted, and the species now occurs in small populations near Velarde, Isleta Pueblo, Sevilleta NWR/La Joya State Wildlife Area (SWA), Bosque del Apache NWR, San Marcial, and Fort Selden. The species occurs statewide in the spring and autumn migration, but the migration routes and destinations of the Southwestern willow flycatcher are not well understood.

Suitable habitat for the Southwestern willow flycatcher is found throughout the southern third of the study area, and numerous sightings of the species have been recorded in the general vicinity of SMC and SFC transects. All other proposed well lines are located more than 0.5 miles away from the sightings recorded in 2001. In 1999, the BOR recorded sightings of 46 pairs nesting, plus 7 non-nesting pairs and a few unpaired males within the reach (Ahlers & White,2000 2001). Continued annual surveys indicate that the population of this endangered subspecies is increasing in the study area (Personal communication, Ann Janik, June 2002).

3.09.3 Bald eagle (*Haliaeetus leucocephalus*)

The Bald eagle, a USFWS and NMDGF Threatened species, are closely associated with open expanses of water and are most likely found in all habitats near open water. They are found in a variety of forest habitats including Douglas fir, hemlock-sitka spruce, redwood, ponderosa pine, larch/white pine, lodgepole pine, fir-spruce, aspen (hardwoods), chaparral, and piñon-juniper forest types. Bald eagles commonly winter in habitats adjacent to oceans, rivers, lakes, or where carrion is available. Bald eagles typically night-roost in groups in protected areas, such as canyons. Populations in New Mexico occur near streams and lakes. A few nests have been reported from New Mexico, located in trees and on cliffs, which are typical nesting sites for the eagle. The major food items of bald eagles in New Mexico appear to be waterfowl, fish, and carrion (NMDGF, 2001b).

Bald eagles are uncommon during the summer and do not breed regularly in the state. The nests that have been reported are located in the extreme north and western portions of the state. Important winter areas include the San Juan, upper Rio Grande, upper and middle Pecos, Canadian, San Francisco, Gila, and Estancia valleys. Mid-winter surveys conducted annually by the NMDGF showed that the number of bald eagles wintering in New Mexico steadily increased during the preceding 15 years, from an annual average of 220 birds in the early 1980's to 450 by the mid 1990's.

A number of individuals winter every year at the headwaters of Elephant Butte, just south of the project area. Bald eagles may occur as winter transients within the project area and may require specific measures to avoid harassment if they are in the vicinity of well-drilling activity.

3.10 CULTURAL RESOURCES

3.10.1 Plan of Study

A cultural resources survey was completed for seven proposed monitoring well transects. Only a select number of well locations and access roads were surveyed, based on consultation with the New Mexico State Historic Preservation Office (SHPO). The factors defining which well locations and access roads should be surveyed took into account the probability for intact archaeological deposits along each of the transects. Well locations lying within the Rio Grande floodplain that were unlikely to contain cultural resources due to stream scour or sediment deposition were eliminated from the survey. Table 3 details the cultural resource survey areas within each transect.

Table 3. Areas Requiring Cultural Resource Surveys.

Transect	Survey Type	Location ID
San Acacia (SAC)	Well Location	W01
	Well Location	W03
	Well Location	W05
	Access Road	Access to E01, E02, and E03
	Access Road	Access to W01
Escondida Bridge (ESC)	Well Location	W01
	Well Location	E03
	Access Road	Access to E03
Brown Arroyo (BRN)	Well Location	W01
	Well Location	E03
	Well Location	E04
	Well Location	E06
	Access Road	Access to E03
	Access Road	Access to E04 & E06
	Access Road	Access to W01
Highway 380 Bridge (HWY)	Well Location	W01
	Well Location	W02
	Well Location	E03
	Access Road	Access to E03
	Access Road	Access to W01
	Access Road	Access to W02
South Boundary of Bosque del Apache (SBB)	Access Road	Access to E03
San Marcial (SMC)	Well Location	W01
South Fort Craig (SFC)	Well Location	W01
	Access Road	Access to W01

The New Mexico Historic Preservation Division's Archaeological Records Management Section database was searched to identify cultural resources, archaeological sites, and National or State Register of Historic Properties reported within the vicinity of the seven transects. The data base search found a number of significant cultural resources within one mile of several project areas. The previously recorded and newly discovered sites and properties for each transect are summarized below.

3.10.2 Cultural Resources Found in the Project Area

The survey resulted in the identification of scores of previously recorded archaeological sites within one mile of the seven transects. Most of the sites are located on the first terrace above the Rio Grande floodplain, greater than 50 feet from the well transects. Two new sites, LA

135588 and LA 135866, were discovered during this Investigation and are within the proposed work areas. LA 135588 is a small prehistoric site that may be eligible to the National Register of Historic Places (NRHP). LA 135866 is a historic ranching facility and may not be eligible for inclusion to the NRHP. Determination of eligibility will be made by the Corps of Engineers in consultation with the New Mexico State Historic Preservation Office.

San Acacia Transect (SAC). At least 21 previously recorded archaeological resources are located within one mile of the SAC. These archaeological sites include a number of large prehistoric and historic sites and Hispanic villages considered eligible for inclusion to the National Register of Historic Places (NRHP). Within this transect the proposed access to well locations E01, E02, and E03, an existing abandoned road, directly impinges on site LA 31704. An element of LA 31704 containing petroglyphs has collapsed and now lies directly in the path of the road. Efforts to clear the road would take considerable effort and the probable use of heavy machinery. The access road skirts the edge of site LA 31706 (Aldea de San Acacia) but no cultural resources related to that site were observed. None of the well locations or their alternates contained cultural resources. One Isolated Occurrence (IO) was located in the access road however the potential for information has been exhausted by its recording.

Escondida Bridge Transect (ESC). The Escondida Bridge transect has at least eight significant prehistoric cultural resources within one mile including two large prehistoric sites, LA 283 (El Barro) and 761 (Pueblito Pueblo). These two sites are within approximately 100 meters of two of the surveyed well locations and one access road. The survey found no artifacts or cultural resource manifestations at any of the survey locations. The locations of well pad W01 in particular have been previously severely disturbed. The survey found no artifacts or cultural resource manifestations along the access road and well pad E03 and its access road.

Brown Arroyo Transect (BRN). There are at least 24 previously recorded archaeological resources within one mile of the Brown Arroyo transect. The archaeological sites include a number of large prehistoric and historic sites and the Hispanic village of Luis Lopez. All the sites are considered potentially eligible to the NRHP and one site, LA 282 is already listed on the NRHP. All but one of the sites are located on the first terrace above the Rio Grande. The proposed well locations and access roads would not impact any of the previously recorded archaeological sites. However, a newly discovered historic site, LA 135866, encompasses the location of Well E04.

Highway 380 Bridge Transect (HWY). The Highway 380 Bridge transect has at least 13 previously recorded prehistoric and historic sites within one mile. The sites mostly consist of historic structures in the village of San Antonio and historic irrigation ditches but also includes the Hispanic village of San Pedro. There are at least five NRHP listed properties in the village of San Antonio. The access road for the first alternative for Well E02 lies adjacent to site LA 119451, a historic irrigation ditch. No cultural resources are located in the access roads or in the vicinity of the proposed wells.

South Boundary of Bosque del Apache Transect (SBB). Two previously recorded archaeological sites are located within one mile of the South Boundary of Bosque del Apache transect but would not be affected by the proposed access road. A newly discovered prehistoric

site, LA 135588, is located just east of the proposed access road. The site contains the potential to yield information important to New Mexico's prehistory and may be eligible to the NRHP, however it would not be affected by the project.

San Marcial Transect (SMC). The San Marcial transect has two previously recorded archaeological sites within one mile. However the two sites are located on a high mesa on the opposite side of the Rio Grande. The two sites would not be affected by the proposed Well W01. No new sites were discovered in the vicinity of Well W01. The proposed activity would have no adverse effect on any cultural resources.

South Fort Craig Transect (SFC). The South Fort Craig transect contains at least 29 previously recorded archaeological sites within one mile. Two sites, LA 597 (Milligan Gulch Pueblo) and LA 1091 (Fort Craig), are listed on the NRHP. The existing access road to Well W01 cuts through sites LA 119463 and LA 119466, and possibly LA 31708. Gravel quarrying activities and road improvements to access the quarries since the sites were recorded has obliterated them and they no longer exist. Two IOs were located along the access road. Their recording has exhausted the data potential for the IOs.

3.11 RECREATIONAL RESOURCES AND LAND USE

All of the proposed well lines are located within the floodplain of the Rio Grande. The well lines within the project reach from San Acacia Diversion Dam to the north boundary of Bosque del Apache National Wildlife Refuge lie adjacent to fallow and/or active agricultural fields. Along this reach in Socorro County, approximately 12,000 acres of land are used for agricultural purposes including alfalfa, pasture grass, sorgum, wheat, corn, and chile pepper cultivation. Alfalfa farming, which is the largest agricultural industry in the Middle Rio Grande, covers approximately 6,600 acres followed by the cultivation of pasture grasses for the feed industry covering approximately 2,900 acres (BOR, 2000a). Sorgum, wheat, corn and chile pepper farming represent less than ten percent of the total agricultural land in the project area, each covering less than 450 acres. Idle and fallow agriculture lands make up the remaining 1,400 acres of land.

Rangeland grazing, which has a long history along the Rio Grande floodplain, also occurs in the project area. Much of the grazing is restricted to Bureau of Land Management (BLM) and Bureau of Reclamation owned lands and predominantly occurs in the southern portion of the reach.

In addition, numerous recreational opportunities are available within the project reach including bird watching, fishing, and hiking. Bosque del Apache National Wildlife Refuge is a significant destination for thousands of visitors each year. Fishing in the Low Flow Conveyance Channel and other flooded areas is a year-round activity in the study area. Most of the proposed well locations occur on private land or limited access areas, therefore specific data on the number of visitors and recreational users are lacking at this time.

3.12 SOCIOECONOMIC CONSIDERATIONS AND ENVIRONMENTAL JUSTICE

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority and Low-Income Populations; February 11, 1994) was designed to focus the attention of Federal Agencies on the human health and environmental conditions of minority and low-income communities. It requires agencies to adopt strategies to address environmental justice concerns within the context of agency operations and proposed actions. In an accompanying memorandum, President Clinton emphasized that existing laws, such as the National Environmental Policy Act (NEPA), should provide an opportunity for federal agencies to assess the environmental hazards and socioeconomic impacts associated with any given agency action upon minority and low income communities.

The project site lies in a sparsely populated area of Socorro County, New Mexico. The year 2000 data from U.S. Census Bureau indicates that the population of Socorro is approximately 18,000, a 22 % increase from 1990. The population is comprised primarily of Hispanics or Latinos who make up 48.7% of the total population. Caucasians not of Hispanic or Latino origins are the next largest race within the County and make up 37.6% of the population, followed by American Indians who account for 10% of the population. African American, Asian American, and Native Hawaiians comprise less than 5% of the population each.

Data from the Final Rio Grande Supplemental Water Environmental Assessment (BOR, 2001b) indicates that Socorro County population is dispersed in small farm communities and isolated farms along the Rio Grande. These farm communities have multi-generational links to a rural and farming life style. In 1992, the County had approximately 16,180 acres of irrigated farmland, of which 13,007 acres were harvested cropland (U.S.Bureau of Census, 1997). Farm earnings, however, accounted for less than 10 percent of the total earnings in Socorro County that year. These statistics indicate that farming has an important social role for the Rio Grande communities in the study area, but is not the economic mainstay.

4. IMPACTS ANALYSIS

4.01 EFFECTS OF FUTURE WITHOUT ACTION

The Future Without Action would consist of the water resources in the San Acacia Reach of the Rio Grande continuing to be managed without comprehensive information on the groundwater component of the water balance. There would be continued problems related to managing the highly variable water supply of the Middle Rio Grande without adequate scientific information. Significant management decisions, such as those currently being evaluated in the Upper Rio Grande Water Operations Review and EIS, would affect the operation of facilities in the reach (ie. the Low Flow Conveyance Channel) without benefit of sound scientific data.

4.02 WATER RESOURCES

Impacts of the proposed alternatives in the study area would consist of monitoring wells in three different groundwater zones at depths of 5-20 feet, approximately 45 feet, and approximately 100 feet. Water quality of the groundwater in the region is not well documented; however, it is unlikely that discharges resulting from the project would impair surface water quality in the receiving body. The impacts to groundwater resources would be of limited duration during pumping activities associated with well installation and testing.

A recent aquifer test was conducted approximately one-half mile north of the Highway 380 transect, with a pumping rate was 1,500 gallons per minute. In that test, after 24 hours, an observation well located 4 feet from the pumping well had a drawdown in water level of 5.7 feet; an observation well 18 feet from the pumping well had approximately 3.8 feet of drawdown. It is not known what conditions would be encountered at the locations of the test wells proposed for this drilling program – however, it is expected that they may be similar to those of the test reported above.

The Clean Water Act requires that point source discharges into Waters of the United States be permitted under the National Pollutant Discharge Elimination System (NPDES). As the testing of the groundwater wells may require discharges to the Rio Grande or an associated tributary. Compliance with NPDES will be assured prior to aquifer pumping tests.

Based on the results from the aquifer test described above, measurable changes in water levels may be detected up to several hundred feet from some of the pumped wells. Surface water bodies would potentially experience a relative reduction of flow, or an increase in water losses in areas where these lowered groundwater levels intercept them, until such time as static water levels return. For pumping of the relatively short durations proposed (1 to 3 days), the potential effects on the Rio Grande and/or the LFCC would be negligible.

4.03 FLOODPLAINS AND WETLANDS

Much of the floodplain of the Rio Grande in the study area has been altered as a result of channel aggradation and invasion by exotic vegetation such as salt cedar, and none of the proposed well locations occur in a jurisdictional wetland. Some minimal and very temporary impacts to the floodplain would result from the installation of wells in the study area. However, the wells do not impose any obstruction to the flow of water in the floodplain or other encroachment. Nor do the proposed groundwater monitoring wells withdraw water or otherwise affect the groundwater quality or quantity.

4.04 AIR QUALITY AND NOISE

The proposed action would generate noise levels between approximately 40 and 110 decibels, roughly equivalent to an idling diesel engine and a passing train, respectively. Depending on method used, the one-time drilling operations would generate the highest levels of noise. The periodic well testing and monitoring would generate much lower levels. The No Action alternative would not result in any further noise production beyond the existing ambient levels.

In accordance with Socorro County Ordinance 01-002, sound from a vehicle being operated on public or private property that is not a roadway shall not exceed 78 decibels as measured at the receptor property line. Sound levels for a vehicle with a gross weight of over 10,000 pounds on a roadway are limited to 90 decibels, and vehicles under 10,000 pounds are limited to 80 decibels. Non-vehicular noise is limited to either 10 decibels above ambient or 80 decibels, whichever is higher, as measured at the property line.

The movement of sound through an open, unrestricted space follows the inverse square law. This equation implies that for each doubling of distance from a noise source, the sound intensity would decrease by 6 decibels. Using this equation, the maximum decibels levels calculated for receptors within the proposed project area are given in Table 4.

Table 4. Maximum Calculated Noise Levels (decibels) for Residences Near a Proposed Well Line.

Type of Machinery	Average dB level	Property West of SAC-W01AB	Property West of ESC-W01AB	Property North of BRN-W02A	Property South of BRN-W02A
G40 hammer rig	110	64	73	66	63
G60 hammer rig	102	56	65	58	55
CME 75 auger	88	42	51	44	41
Rota-Sonic auger	85	39	48	41	38
60 kW generator	76	30	39	32	29
125 kW generator	83	37	46	39	36

4.05 AESTHETICS

Potential visual impacts stem from the sight of the well drilling rigs and supporting vehicles. This impact would be short-lived and is consistent with other operations in the area. It is anticipated that, with the exception of maintenance crews and others working in the area, the entire well construction and monitoring program would be completely out of public view.

4.06 SPECIAL STATUS SPECIES AND VEGETATION

The project will not likely have any adverse effect on the three listed species found in the project area. A Biological Assessment and request for concurrence with this determination was submitted to the US Fish and Wildlife Service in June 2002. The Service has concurred with this determination. The following environmental commitments have been made for the protection of listed species:

Rio Grande silvery minnow
Lowering of river flows during the short aquifer pumping tests, though only a slight possibility, may affect available habitat for the endangered Rio Grande silvery minnow if conducted when river flow is already low. Monitoring of river flow during aquifer pumping tests would take place to assure that the flow requirements of the Programmatic Biological Opinion on the Effects of Actions Related to Water Management on the Rio Grande are not impaired.

Bald eagle:
Installation of the wells would take place during the period when bald eagles may be present in the project area, therefore human noise and disturbance may affect this species. Prior to beginning or renewing well drilling at a site, the area would be scanned for the presence of bald eagles within 0.5 mile. If eagles are found, work at that site would be postponed until the eagle leaves the vicinity. However, if an eagle enters the area during construction, work does not need to be suspended. Should eagles be found to use an area consistently, the Service would be notified.

Southwestern willow flycatcher
Impacts to Southwestern willow flycatchers may occur from noise or other human disturbances during the active nesting season in southern portions of the study area. There are numerous southwestern willow flycatcher nest sites and territories known along the river within a half-mile of San Marcial (SMC) and South of Fort Craig (SFC) transects. The SMC line is within 900 feet of known southwestern willow flycatcher nest sites. The second well location west of the LFCC road in the SFC transect (SFC W03ABC) is about 400 meters from an active southwestern willow flycatcher nesting territory. However, since well installation would take place outside the nesting season, the study would not result in any significant new disturbances. Foot access to well locations near known Southwestern willow flycatcher nests and hand drilling of wells would be implemented to avoid all unnecessary vegetation disturbance and noise. The project construction schedule would take place outside of the bird-nesting season to further eliminate any disturbance to

Southwestern willow flycatcher. Access to monitoring sites near flycatcher territories may be seasonally restricted at the discretion of management and regulatory agencies. Because of this, impacts to this endangered species are not anticipated.

Direct impacts to vegetation in the SMC and SFC transects would also be of concern because it may provide habitat for the federally endangered Southwestern willow flycatcher. The direct removal of suitable habitat of dense woody vegetation or potentially suitable habitat types would be considered adverse impacts. This impact would occur during the one-time event of well installation and could easily be mitigated. Steps have been taken to avoid such impacts by locating wells and access roads in habitats which are not suitable, such as agricultural fields, pastures or previously cleared areas and abandoned roads which would minimize the need for vegetation removal.

The development of Class 3 and Class 4 roads would have impacts to vegetation, as discussed below by transect. All areas would be accessed without bulldozing or blading and low vegetation would be driven over by the drilling rig and allowed to rebound whenever possible. A chainsaw would be used to clear branches or trees that cannot be driven over.

San Acacia (SAC) Transect

Table 5 shows the disturbance areas and vegetation types that would be impacted by construction activities in the SAC. Ten wells, including one extraction well and nine monitoring wells, and two staff gauges are proposed for installation along the San Acacia well line. A maximum of 0.77 acres of existing agricultural and pasture vegetation would be cleared during the construction phase. No significant adverse impacts to vegetation would be anticipated from installation and monitoring of the proposed wells in this transect.

Table 5. San Acacia Transect Vegetation Disturbance.

Road Classification	***Area***		***Vegetation Type***
	ft^2	***acres***	
3	11,761	0.27	Agriculture/pasture land
4	20,473	0.47	Agriculture/pasture land
Road Total	32,234	0.74	
AquiferTests (1)	1,200	0.03	Degraded agricultural/pasture land
Total	**33,434**	**0.77**	Agricultural/pasture land

Escondida Bridge (ESC) Transect

Table 6 indicates the disturbance expected from construction activities in ESC transect. Total disturbance is expected to result in a maximum of 0.03 acres of vegetation removal, all previously disturbed. All of the well sites within this line occur in agricultural

or otherwise highly disturbed areas. The well sites near the river are in an area that receives regular recreational use. All of the sites can be easily accessed by existing roadways and no significant adverse impacts to vegetation would be anticipated from installation and monitoring of the proposed wells in this transect.

Table 6. Escondida Bridge Transect Vegetation Disturbance.

Road Classification	*Area*		*Vegetation Type*
	ft²	*acres*	
3	0	0.00	N/A
4	0	0.00	N/A
Road Total	0	0.00	N/A
Aquifer Tests (1)	1,200	0.03	Disturbed agricultural land
Total	**1,200**	**0.03**	Disturbed agricultural land

Brown Arroyo (BRN) Transect

Table 7 shows that a maximum of 0.68 acres of vegetation would be removed during the construction of wells in BRN transect. No significant adverse impacts to vegetation would be anticipated from installation and monitoring of the proposed wells in this transect. The well sites on the east side of the river are located in pasturelands within a fragmented cottonwood woodland. Most of the cottonwoods in this area are very mature and there is minimal recruitment of seedlings. The understory is made up of an open scattering of saltcedar stands. The west side sites are in agricultural and pasture lands along or near established roadways. The most diverse habitat is found within the jetty jackfield and cottonwood/saltcedar stands near the river (W05AB).

Table 7. Brown Arroyo Transect Vegetation Disturbance.

Road Classification	*Area*		*Vegetation Type*
	ft²	*acres*	
3	29,415	0.68	Agriculture/pasture land
4	0	0.00	N/A
Road Total	29,415	0.68	
AquiferTests (1)	0	0.00	N/A
Total	**35,415**	**0.68**	Agriculture/pasture land

Highway 380 Bridge (HWY) Transect

Table 8 shows that a maximum of 2.17 acres of vegetation, some of which is cottonwood woodland, would be disturbed as a result of the proposed project. No

significant adverse impacts to vegetation would be anticipated from installation and monitoring of the proposed wells in this transect. The well sites on the west side of the river are in a combination of agricultural, roadway, and disturbed cottonwood woodland areas. The east side sites are in weedy openings within the Rio Grande floodplain, with the exception of the first site east of the river, which is within a narrow band of medium-aged cottonwoods.

Table 8. Highway 380 Bridge Transect Vegetation Disturbance.

Road Classification	***Area***		***Vegetation Type***
	ft^2	***acres***	
3	69,990	1.61	Agricultural and disturbed woodland
4	23,280	0.53	Disturbed cottonwood woodland
Road Total	93,270	2.14	N/A
Aquifer Tests (1)	1,200	0.03	Agricultural and disturbed cottonwood/woodland area
Total	**94,470**	**2.17**	Agricultural and disturbed cottonwood woodland

South Boundary of Bosque del Apache (SBB) Transect

Table 9 summarizes vegetation removal during the construction phase of the proposed project. The sites on the west side of the river are within cleared portions of native and exotic riparian vegetation. While the entire line is within a general area of potentially suitable, yet unoccupied, southwestern willow flycatcher habitat, all specific well sites are in areas that have previously been cleared for other activities. The proposed project would result in a maximum of 0.06 acres of vegetation disturbance. No significant adverse impacts to vegetation would be anticipated from installation and monitoring of the proposed wells in this transect.

Table 9. South Boundary of Bosque del Apache Transect Vegetation Disturbance.

Road Classification	***Area***		***Vegetation Type***
	ft^2	***acres***	
3	0	0	N/A
4	0	0	N/A
Road Total	0	0.00	N/A
Aquifer Tests (1)	2,400	0.06	Disturbed pasture w/Cottonwood and Saltcedar
Total	**2,400**	**0.06**	Disturbed pasture w/Cottonwood and Saltcedar

San Marcial (SMC) Transect—

Table 10 provides a summary of the vegetation disturbance anticipated from construction of wells in SMC transect. The well lines are located in an area of secondary riparian vegetation that is developing on a pasture. A maximum of 0.03 acres of young cottonwood and saltcedar saplings would be temporarily disturbed during well installation. Vegetation would be disturbed by driving over young trees and saplings, and cutting off any larger branches with a chainsaw. The vegetation would be allowed to regenerate naturally, and its recovery would be monitored. No significant adverse impacts to vegetation would be anticipated from installation and monitoring of the proposed wells in this transect.

Table 10. San Marcial Transect Vegetation Disturbance.

Road Classification	*Area*		*Vegetation Type*
	ft^2	*acres*	
3	0	0.00	N/A
4	0	0.00	N/A
Road Total	0	0.00	N/A
Aquifer Tests (1)	1,200	0.03	Disturbed pasture w/Cottonwood and Saltcedar
Total	**1,200**	**0.03**	Disturbed pasture w/Cottonwood and Saltcedar

South of Fort Craig (SFC) Transect

Table 11 shows that approximately 1.72 acres of existing vegetation would be cleared during the construction phase for the wells in the SFC transect. No significant adverse impacts to vegetation would be anticipated from installation and monitoring of the proposed wells in this transect.

The road indicated on Figures 9A and 9B follows a path of less dense vegetation as indicated on the satellite image and through field reconnaissance in order to minimize the amount of clearing required. The second well location west of the LFCC road (W03ABC) is about 400 meters from an active southwestern willow flycatcher nesting territory. Access to this site would require a fair amount of vegetation removal and overall vehicular disturbance. Hand drilling and restricted access to periods outside of the breeding season is recommended for this site. The east side of the LFCC contains open-to-dense cottonwood/Russian olive/saltcedar woodlands of diverse age structure. The dense vegetation west of the LFCC road provides suitable habitat for southwestern willow flycatchers and other TES species associated with riparian communities.

All well sites on the west side of the channel should be accessed with only a minimum of disturbance to natural vegetation. In order to avoid potential impacts to nesting flycatchers near WO3ABC, mechanized vegetation clearing would not be allowed.

Vehicular access would only be allowed outside of the flycatcher nesting season (April 15-August 15) and may be achieved by driving over existing vegetation and allowing it to rebound. All monitoring would take place thereafter by foot access only.

Table 11. South of Fort Craig Transect Vegetation Disturbance.

Road Classification	*Area*		*Vegetation Type*
	ft^2	*acres*	
3	38,430	0.88	Cottonwood/Russian Olive/Saltcedar woodlands
4	36,510	0.84	Cottonwood/Russian Olive/Saltcedar woodlands
Road Total	74,940	1.72	N/A
Pump Tests (1)	0	0.00	N/A
Total	**74,940**	**1.72**	Cottonwood/Russian Olive/Saltcedar woodlands

The overall total vegetation disturbance from this project is limited to 5.46 acres of agricultural and disturbed mixed woodland habitats. Since these vegetation types are relatively common in the region and the direct and indirect impacts to vegetation are minor and temporary, no long-term degradation or loss of vegetation from the project is anticipated.

No significant adverse impacts to habitat for the Southwestern willow flycatcher would be anticipated from installation and monitoring of the proposed wells in this Investigation, but vegetation removal and recovery in the SMC and SFC transects would be tracked. Should vegetation fail to recover during the period of the study, replanting would take place at a ratio of three vegetation units replanted for every unit lost.

4.07 WILDLIFE

The project would have no direct adverse impacts on wildlife. Indirect impacts from disturbance of wildlife during well installation will be temporary and insignificant. As discussed above, the riparian habitat in the study reach has been degraded and fragmented in all transects except SMC and SFC, making the areas less desirable for many wildlife species. No more than 7 acres of the available vegetation will be temporarily disturbed by the proposed construction activities. Noise and human disturbance will also briefly disturb wildlife using the area.

4.08 CULTURAL RESOURCES

The proposed Investigation is not anticipated to have adverse effects to any cultural resource properties eligible for the National Historic Preservation Act (NHPA) within the project Area of Effect. Use of one proposed access road in the San Acacia Transect on the east side of the Rio Grande would require movement of a portion of LA 31704 that was previously damaged and is no longer eligible for the NHPA. SWCA has recommended that

an alternative access route or modality (i.e. non-motorized access) be utilized or that an archaeological monitor be present if the rock is moved to assure that the nearby, undamaged site components are not damaged. Concurrence from the SHPO is necessary before these recommendations are considered final.

In the event that a previously unrecorded archaeological site or cultural material is discovered within the access roads or during the proposed well drilling all activity in the immediate area would cease pursuant to Federal regulation 36CFR800.13. Work can resume only after the significance and disposition of the archaeological remains have been evaluated, and a determination of significance made in consultation with the New Mexico State Historic Preservation Officer.

4.09 RECREATIONAL RESOURCES AND LAND USE

The proposed action would not preclude any of the current land uses, including recreation, farming, or cattle grazing. Impacts to grazing would be minimal as livestock are free to move through well locations. An increase in public access into some currently isolated locations would occur when the existing or abandoned roads are cleared of obstructive vegetation. Since these access roads would terminate at well sites and would be allowed to revegetate naturally, they should be of little interest to recreational users in the area.

4.10 SOCIOECONOMIC CONSIDERATIONS AND ENVIRONMENTAL JUSTICE

In Socorro, the average household of 2.62 people has a median income of $24,025 with a majority of the residents being employed by the agricultural industry (U.S. Census Bureau, 2001). The two main agricultural businesses in the area include alfalfa and other hay production and cattle ranching. These enterprises rely heavily on irrigation from the Rio Grande. The proposed action to study the relationship between the groundwater and surface water along the river would have no significant effect on the people or agricultural businesses in the area.

It is not anticipated that the proposed monitoring and construction activities for the Preferred Alternative would increase or decrease property values, displace residents, induce new development, change accessibility to community facilities, or cause the loss of agricultural land. No disproportionately high environmental/socioeconomic effects on minority or low-income communities would be a result from the proposed project.

The continued availability of reliable irrigation water is of high importance to the region. Potential benefits of the project to the agricultural communities of Socorro County would derive from improved water management strategies that may result from better understanding of hydrologic processes. Results of the Investigation may help water resource managers better distribute the available water to meet demands from water users in the region.

4.11 CUMULATIVE IMPACTS, IRREVERSIBLE & IRRETRIEVABLE COMMITMENTS OF RESOURCES

No irreversible or irretrievable commitments of resources would result from this project, since the project would not extract nonrenewable resources or permanently modify the ecological function of the area or landscape.

The Council of Environmental Quality defines a cumulative impact as follows:

> The impact on the environment which results from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individual minor, but collectively significant, actions taking place over a period of time (40 CFR §1508.7)

Cumulative impacts are most likely to arise when a relationship exists between a proposed action and other actions expected to occur in the area of potential effect for the resources analyzed and also in a similar time period. Projects in close proximity to the proposed action would be expected to have a greater potential for a relationship that could result in potential cumulative impacts than those more geographically separated.

As mentioned in Section 1.02, there are a number of current federal and non-federal projects in the study area. These projects reflect the combined chronic problems in the proper functioning of the floodway as sediments have built up and the river's hydrology has been affected. Current projects include the proposed Rio Grande and Low Flow Conveyance Channel Modifications, affecting the west side of the Rio Grande floodplain below San Marcial, the Upper Rio Grande Water Operations Review, potentially affecting changes in river hydrology, Designation of Critical Habitat for the Rio Grande Silvery Minnow, also affecting the river hydrology, and the Discretionary Actions Related to Water Management on the Middle Rio Grande proposed by the Corps of Engineers and the Bureau of Reclamation.

Cumulative impacts from the proposed and other actions would result from increased foot and vehicular traffic, increased human activity to monitor and conduct field investigations and riparian restoration. This increased volume of pedestrian and vehicular use of the area would be short lived during the construction phase during Fall and Winter of 2002. Long-term cumulative effects are minimal.

The benefits that would derive from this project include the improved understanding of the hydrology of the watershed. Studies into the nature of the surface and groundwater interaction are of critical importance in developing viable long-term water planning objectives that better meet the legal requirements of the Endangered Species Act and the Rio Grande Compact.

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Years of Experience: 5

6. REFERENCES CITED

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APPENDIX A

Threatened, Endangered, Sensitive, Candidate and Species of Concern Wildlife in Socorro County, New Mexico

Appendix A

Table 1. Threatened (T), Endangered (E), Sensitive (S), Candidate (C) and Species of Concern (SC) wildlife in Socorro County, New Mexico (from NMDGF, 2001; USFWS, 2001).

Common Name (*Scientific Name*)	Status		General Habitat	Project Impact
	FWS	NM		
INVERTEBRATES				
Desert viceroy butterfly (*Limenitis archippus obsoleta*)	SC	--	Willow-lined seeps and springs; wetlands	None – Suitable habitat does not exist in the project area
Socorro mountainsnail (*Oreohelix socorroensis*)	--	S	Various mountain habitats	None – No suitable habitat exists in the project area
Chupadera pyrg snail (*Pyrgulopsis chupaderae*)	C	E	In Willow Spring at south end of Chupadera Mountains	None – No suitable habitat exists in the project area
Socorro pyrg snail (*Pyrgulopsis neomexicana*)	E	E	Thermal waters of Torreon Spring	None – No suitable habitat exists in the project area
Socorro Isopod (*Thermosphaeroma thermophilum*)	E	E	Thermal waters of Sedillo Spring	None – No suitable habitat exists in the project area
Alamosa tyronia snail (*Tyronia alamosae*)	E	T	In Ojo Caliente and Warm Spring	None – No suitable habitat exists in the project area
FISH				
Longfin dace (*Agosia chrysogaster*)	SC	--	Perennial reaches in riparian woodlands	None – Suitable habitat does not exist in the project area
Rio Grande sucker *(Catostamus plebius*)	SC	--	Fast-moving mid elevation streams	None – Suitable habitat does not exist in the project area
Rio Grande silvery minnow (*Hybognathus amarus*)	E	E	Silt/sand substrates with slow back water	**Possible**– Suitable habitat exists throughout the project area
Flathead chub (*Platygobio gracilis*)	SC	--	Turbid, alkaline waters with sifting substrates	None – Suitable habitat does not exist in the project area
AMPHIBIANS AND REPTILES				
Arizona western toad (*Bufo microscaphus microscaphus*)	SC	S	Willow, sandy banks, intermittent pools	None – No specimens found in the study reach
Chiricahua leopard frog (*Rana chiricahuensis*)	PT	S	Permanent aquatic habitats	None – No specimens found in the study reach
Texas horned lizard (*Phrynosoma cornutum*)	SC	--	Open grasslands and prairies	None – No suitable habitat exists in the project area
Big Bend slider (*Trachemys gaigeae*)	--	S	Ponds and ditches w/ abundant pondweed & algae	None – No specimens found in the study reach

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Appendix A

Table 1 – *continued.* Threatened (T), Endangered (E), Sensitive (S), Candidate (C) and Species of Concern (SC) wildlife in Socorro County, New Mexico (from NMDGF, 2001; USFWS, 2001).

Common Name (*Scientific Name*)	Status		General Habitat	Project Impact
	FWS	NM		
BIRDS				
Northern goshawk (*Accipter gentilis*)	SC	S	Desert riparian woodlands	None – Occurrence in the proposed project area unlikely
Violet crowned hummingbird (*Amazilia violiceps ellioti*)	--	T	Summers in riparian areas of Guadalupe Mountains	None - No suitable habitat exists in the project area
Baird's sparrow (*Ammodramus bairdii*)	SC	T	Winters in prairies	None – No suitable habitat exists in the project area
Ferruginous hawk (*Buteo regalis*)	SC	--	Arid plains, open rangeland	None – No suitable habitat exists in the project area
Common black hawk (*Buteogallus anthracinus*)	--	T	Woodlands along lowland streams	None – Occurrence in the proposed project area unlikely
Piping plover (*Charadrius melodus*)	T	E	Sandflats and bare shorelines	None – Occurrence in the proposed project area unlikely
Mountain plover *(Charadrius montanus*)	PT	S	Semi-arid grassland and plains	None – No suitable habitat exists in the project area
Black tern (*Chlidonias niger*)	SC	--	Inland lakes and marshes	**Possible** – Suitable habitat exists in the proposed project area
Yellow-billed cuckoo (*Coccyzus americanus*)	C	--	Dense riparian trees and shrubs	**Possible** – Suitable habitat exists in the proposed project area
Common ground-dove (*Columbina passerina pallescens*)	--	E	Desert scrub and riparian areas	None – Occurrence in the proposed project area unlikely
Southwestern willow flycatcher (*Empidonax traillii extimus*)	E	E	Dense riparian groves	**Possible**– Suitable habitat exists in the proposed project area
Aplomado falcon (*Falco femoralis septentrionalis*)	E	E	Grassy plains with mesquite	None – No suitable habitat exists in the proposed project area
American peregrine falcon (*Falco peregrinus anatum*)	SC	T	Croplands, meadows, riverbottoms, marshes, and lakes	**Possible** – Suitable foraging habitat exists in the project area
Artic peregrine falcon (*Falco peregrinus tundris*)	SC	T	Croplands, meadows, riverbottoms, marshes, and lakes	**Possible** – Suitable foraging habitat exists in the project area

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Appendix A

Table 1 – *continued.* Threatened (T), Endangered (E), Sensitive (S), Candidate (C) and Species of Concern (SC) wildlife in Socorro County, New Mexico (from NMDGF, 2001; USFWS, 2001).

Common Name (*Scientific Name*)	Status		General Habitat	Project Impact
	FWS	NM		
BIRDS				
Whooping crane (*Grus americana*)	E	E	Agricultural fields and valley pastures	None – Occurrence in the proposed project area unlikely
Bald eagle (*Haliaeetus leucocephalus*)	T	T	Associated with habitats near open water	**Possible** – Suitable foraging habitat exists in the project area
Loggerhead shrike (*Lanius ludovicianus*)	SC	--	Desert scrub and open country	None – No suitable habitat exists in the proposed project area
Brown pelican (*Pelecanus occidentalis brasilianus*)	E	E	Rivers, lakes, reservoirs	None – Occurrence in the proposed project area unlikely
Neotropic cormorant (*Phalacrocorax brasilianus*)	--	T	Marshy ponds and shallow inlets	None – Occurrence in the proposed project area unlikely
White-faced ibis (*Plagadis chihi*)	SC	--	Freshwater marshes and backwaters	None – Occurrence in the proposed project area unlikely
Interior least tern (*Sterna antillarum athalasso*)	E	E	Sand bars, alkali flats, islands	None – Occurrence in the proposed project area unlikely
Mexican spotted owl (*Strix occidentalis lucida*)	T	S	Mature mixed conifer and pine-oak forests	None - No suitable habitat exists in the proposed project area
Bell's vireo (*Vireo bellii)*	--	T	Willow thickets along streams	**Possible** – Suitable habitat exists in the proposed project area
Gray vireo (*Vireo vicinor*)	--	T	Open woodlands with well-developed grasslands	None - No suitable habitat exists in the proposed project area
MAMMALS				
Ringtail (*Bassariscus astutus*)	--	S	Rocky and broken areas near water	None – No suitable habitat exists in the project area
Common hog-nosed skunk (*Conepatus mesoleucos*)	--	S	Various habitats, oak and juniper woodlands	None – No suitable habitat exists in the project area
Gunnison's prairie dog (*Cynomys gunnisoni*)	--	S	Grasslands and low valleys to montane meadows	None - No suitable habitat exists in the project area

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Table 1 – *continued.* Threatened (T), Endangered (E), Sensitive (S), Candidate (C) and Species of Concern (SC) wildlife in Socorro County, New Mexico (from NMDGF, 2001; USFWS, 2001).

Common Name (*Scientific Name*)	Status		General Habitat	Project Impact
	FWS	NM		
MAMMALS – *cont'd*				
Spotted bat (*Euderma maculatum*)	SC	T	Rocky outcrops, mature forest, caves	None - No suitable habitat exists in the project area
Desert pocket gopher (*Geomys arenarius brevirositis*)	SC	--	Sandy or loamy soils of White Sands area	None - No suitable habitat exists in the project area
Allen's big-eared bat (*Idionycteris phyllotis*)	SC	S	Ponderosa pine forests, mixed woodlands	None - No suitable habitat exists in the project area
Black-footed ferret (*Mustela nigripes*)	E	E	Shrub and brush rangelands	None – Species extirpated from NM
Western small-footed myotis bat (*Myotis ciliolabrum melanorhinus*)	--	S	Varied - associated with mines and caves	None - No suitable habitat exists in the project area
Long-eared myotis bat (*Myotis evotis evotis*)	SC	T	Varied - associated with mines and caves	None - No suitable habitat exists in the project area
Occult little brown myotis bat (*Myotis lucifugus occultis*)	SC	S	Varied - associated with mines and caves	None - No suitable habitat exists in the project area
Fringed myotis bat (*Myotis thysanodes thysanodes*)	SC	S	Varied - associated with mines and caves	None - No suitable habitat exists in the project area
Long-legged myotis bat (*Myotis volans interior*)	--	S	Varied - associated with mines and caves	None - No suitable habitat exists in the project area
Yuma myotis bat (Myotis yumanensis yumanensis)	--	S	Varied - associated with mines and caves	None - No suitable habitat exists in the project area
Pecos river muskrat (*Ondatra zibethicus ripensis*)	SC	S	Pecos River and tributaries	**Possible** – Suitable habitat exists in the proposed project area
Desert bighorn sheep (*Ovis canadensis mexicana*)	--	E	Arid, rocky mountains, open habitats	None - No suitable habitat exists in the project area
Pale Townsend's big-eared bat (*Plecotus towsendii pallescens*)	SC	S	Varied - associated with mines and caves	None - No suitable habitat exists in the project area

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Appendix A

Table 1 – *continued.* Threatened (T), Endangered (E), Sensitive (S), Candidate (C) and Species of Concern (SC) wildlife in Socorro County, New Mexico (from NMDGF, 2001; USFWS, 2001).

Common Name (*Scientific Name*)	Status		General Habitat	Project Impact
	FWS	NM		
MAMMALS – *cont'd*				
Western spotted skunk (*Spilogale gracilis*)	--	S	Various rocky and brushy areas	None - No suitable habitat exists in the project area
Organ Mountains Colorado chipmunk (*Tamias quadrivittatus australis*)	SC	T	Ponderosa pine forests, mixed woodlands	None - No suitable habitat exists in the project area
Red fox (*Vulpes vulpes*)	--	S	Open woodlands, areas adjacent to urban areas	None - No suitable habitat exists in the project area
New Mexican jumping mouse (*Zapus hudsonius luteus*)	SC	T	Dense riparian forb-grass communities	None – No significant impact expected

Appendix A

Table 2. Threatened (T), Endangered (E), Sensitive (S), Candidate (C) and Species of Concern (SC) wildlife in Socorro County, New Mexico (from USFWS, 2001; MRPTC, 2001; Sivinski and Lightfoot, 1995).

Common Name (*Scientific Name)*	Status		General Habitat	Project Impact
	FWS	NM		
PLANTS				
Fugate's amsonia (*Amsonia fugatei*)	SC	SC	In Chihuahuan Desert Scrub	None - No suitable habitat exists in the project area
Cliff brittlebush (*Apacheria chiricahuensis*)	--	SC	North-facing cliffs of limestone or rhyolite	None - No suitable habitat exists in the project area
Sandhill goosefoot (*Chenopodium cycloides*)	SC	--	Grasslands, sand dunes and blowouts	None - No suitable habitat exists in the project area
Rock fleabane (*Erigeron scopulinus*)	--	SC	Crevices in cliff faces of rhyolite rock	None - No suitable habitat exists in the project area
Tall bitterweed (*Hymenoxys brachyactis*)	--	SC	Piñon-juniper woodland and lower montane conifer forest	None - No suitable habitat exists in the project area
San Mateo penstemon (*Penstemon pseudoparvus)*	--	SC	Pine and oak woodlands	None - No suitable habitat exists in the project area
Dune unicorn plant (*Proboscidea sabulosa)*	--	SC	Semi-stabilized dunes in Chihuahuan Desert Scrub	None - No suitable habitat exists in the project area
Davidson's cliff carrot (*Pteryxia davidsonii)*	--	SC	Piñon-juniper woodland and lower montane conifer forest	None - No suitable habitat exists in the project area
Plank's campion (Silene plankii)	--	SC	Igneous cliffs and rocky outcrops	None - No suitable habitat exists in the project area
Wright's campion (*Silene wrightii)*	--	SC	Mountain montane and subalpine conifer forest	None - No suitable habitat exists in the project area

APPENDIX B
Agency Correspondence

DEPARTMENT OF THE ARMY
ALBUQUERQUE DISTRICT, CORPS OF ENGINEERS
4101 Jefferson Plaza, NE
Albuquerque, New Mexico 87109-3435
Fax (505) 342-3199

June 21, 2002

Engineering and Construction Division
Environmental Resources Branch

Ms. Joy Nicholopoulos
Field Supervisor
U.S. Fish and Wildlife Service
New Mexico Ecological Services Field Office
2105 Osuna NE
Albuquerque, New Mexico 87113

Dear Ms. Nicholopoulos:

The U.S. Army Corps of Engineers (Corps) and the New Mexico Interstate Stream Commission (NMISC) are proposing to conduct a surface water/groundwater hydrologic investigation in the San Acacia, New Mexico, reach of the Rio Grande. The project entails the installation and monitoring of up to 80 wells and 25 staff gages along seven transects spanning the Rio Grande and the Low Flow Conveyance Channel. The NMISC is sponsoring this study under their responsibility for Rio Grande water operations and compliance of the Rio Grande Compact. The primary objective of the study is to clarify the hydrologic dynamics in this critical reach of the river.

The Corps has made a final determination that the proposed project would not likely adversely affect the endangered Southwestern Willow Flycatcher, the endangered Rio Grande silvery minnow, and the threatened Bald Eagle; nor would it adversely modify proposed critical habitat of the Rio Grande silvery minnow. The Corps and the NMISC request the Service's concurrence with this determination.

A copy of the Biological Assessment (BA) prepared by SWCA Environmental Consultants, Inc., on behalf of the NMISC and the Corps is enclosed and contains an evaluation of all pertinent information regarding listed and candidate species within the project area. Following is a summary of potential effects to listed species and the planned activities which would avoid or minimize those effects. These factors (which are detailed in the BA) form the basis of the Corps' determination.

The potential effect to the Bald Eagle entails indirect disturbance by noise and/or human presence during the drilling and installation of wells during the winter months. Suspension-of-construction-activity practices which have been included in several recent Corps-Service consultations have been adopted in the present project to minimize this disturbance.

Potential impacts to the Rio Grande silvery minnow are direct and include the possibility of slight reductions in flow within the Rio Grande channel, or the temporary degradation of surface water quality, during aquifer test pumping. Test pumping will be limited in both extent and duration, and will not be conducted during dry periods when flow in the Rio Grande channel is extremely low. Water would be discharged to the Rio Grande only if water quality samples collected from the pumping well or one of the adjacent observation wells indicate that the groundwater is of better quality than the water in the Rio Grande. Properties (pH, EC, DO, temperature) of groundwater discharged to the Rio Grande during test pumping will be monitored to ensure that river water quality would not be degraded. These precautions, along with standard best management practices for drilling waste and pumped discharge, would also avoid any significant modification of proposed critical habitat for the minnow.

Potential effects to the Southwestern Willow Flycatcher – and, because of overlap in preferred habitat types, the Yellow-billed Cuckoo (a candidate for listing) – could include the direct effect of suitable vegetation disturbance and indirect effect of noise during well installation. The two southernmost well transects ("San Marcial" and "South of Fort Craig") each include one well location which are within 900 and 650 feet, respectively, of known (2001) flycatcher territories. As detailed in the BA, biologists exercised great care in the field to select access routes and well sites which would minimize disturbance of riparian vegetation and, especially would avoid known flycatcher territories. Well drilling for the entire project is not expected to begin until after August 15 and would be completed prior to May 2003; therefore, flycatchers would be absent from the area during well installation. The Bureau of Reclamation is continuing flycatcher surveys in the general project area during 2002 and these most recent flycatcher locations will be considered prior to the start of well drilling activities. The locations of individual wells can be shifted up to 50 feet or eliminated entirely to avoid directly impinging on occupied areas.

William DeRagon (342-3358) of my staff and Claudia Oakes of SWCA are available to meet with your staff to discuss general and specific aspects of the proposed project at your convenience.

Sincerely,

Julie A. Hall
Chief, Environmental Resources Branch

Enclosure

Copy Furnished w/o enclosure:

A. Norman Gaume, Director
New Mexico Interstate Stream Commission
P.O. Box 25102
Santa Fe, New Mexico 87504

SWCA
ENVIRONMENTAL CONSULTANTS

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7001 Prospect Pl. NE, Suite 100
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July 15, 2002

Robert Sivinski
State Forestry Division
New Mexico Department of Energy, Minerals, and Natural Resources
P.O. Box 1948
Santa Fe, NM 87504

RE: Proposed San Acacia Watershed Surface Water/Groundwater Investigation

Dear Dr. Sivinski,

The U.S. Army Corps of Engineers and the Interstate Stream Commission of the New Mexico Office of the State Engineer have proposed a surface water/groundwater study within the Rio Grande watershed south of San Acacia, Socorro County. SWCA has been contracted to conduct natural resource field investigations and to prepare a Biological Assessment and Environmental Assessment for this project.

The San Acacia Watershed Surface Water/Groundwater Investigation involves the installation and monitoring of 80 wells along seven well lines across the Rio Grande between the San Acacia Diversion Dam and the headwaters of Elephant Butte reservoir (see enclosed map). The purpose of this investigation is to collect data that will contribute to a better understanding of the complex hydrology within this reach.

Extensive efforts were made to minimize the potential impacts of the proposed actions. Well sites and access route locations, construction methods and timing, and the deposition sites of excavation materials and discharge water were all selected based on criteria that offered the highest scientific validity and the least environmental consequences.

SWCA has completed the Draft Biological Assessment for submission to the Fish and Wildlife Service and would be happy to provide a copy for your review. Please contact me if the Department would like to receive this document or if you have any special concerns regarding protected or sensitive species or habitats within the proposed project area.

Sincerely,

Claudia Oakes

Claudia Oakes, Ph.D.
Managing Principal
SWCA – Albuquerque

Enclosure

Cc: William R. DeRagon, US Army Corps of Engineers
Page Pegram, NM Interstate Stream Commission